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THE NORTHWESTERN ELECTRICAL CONVENTION.

The Northwestern Electrical Association convention in Milwaukee last week confined most of its attention to the two subjects uppermost in the minds of Wisconsin central-station men these days, one of these being the tungsten-lamp situation and the other the Wisconsin Public Service Commission. The consensus of opinion was that Wisconsin is to be congratulated on the personnel of its commission and expert staff, and that the records so far show that the commission has gone thoroughly and impartially into every case brought up and with an understanding of the facts which would be impossible to city councils or local governing bodies not versed in the business of electric light and power production. In an address before the convention Professor Meyer, of the commission, although expressing, as he said, only his personal views, presented strong arguments in favor of a plan involving both rates and dividends similar to what is known in gas circles as the London sliding scale. This is a kind of profit-sharing arrangement whereby the company which has enterprise enough to improve its plant and methods so as to increase its net earnings may increase its dividends, if along with this increase the profit is shared with the public by a reduction of rates. The Wisconsin law permits such a plan to be put into operation in connection with the control of public utilities, although this clause is rather indefinite in its provisions, and the working out of the scheme is evidently to be left with the companies, municipalities and the commission.

The tungsten lamp situation was gone over at length in discussion. The interesting announcement was made that American manufacturers are now ready to supply a 4-cp, 5-watt sign lamp intended to operate on a 10-volt circuit supplied from a small 10-volt transformer mounted on or near the sign. There are in existence to-day a large number of signs operated on flat rate and turned on and off by the company. The introduction of the 5-watt sign lamp in place of one taking about 20 watts means a considerable reduction in the capacity required to handle a given amount of sign business, and also some reduction in fuel costs. The series tungsten lamp for street lighting, to judge from the discussion, has come into very general use in place of the carbon-filament series street lamps, about four-fifths of the present series incandescent sales now being, it was stated, of the tungsten type. As regards the economy of the tungsten lamp in the case of small plants, it was pointed out by some of the members who had taken occasion to investigate costs of production closely, that the fixed losses and expenses connected with the operation of a small plant are so great that a reduction of the load by the use of the more efficient lamps is not likely to be noticeable on the ledger at the end of the year, or at least it would be so small as to be hardly worth while. The reverse of this proposition is well known to those familiar with costs in small plants—namely, that the addition of considerable load to a lightly loaded plant adds but a small figure to the total cost of producing power.

The greatest value of the series tungsten lamp in a small central station now operating series carbon lamps is shown to be, first, the better service obtained from the tungsten lamp because of less blackening; and, second, the station capacity set free by its use, which can be sold for other purposes. Thus the substitution of the tungsten lamp for street lighting means virtually an increase in station capacity at a low cost per kilowatt of capacity, and it is the interest and depreciation on station investment per kilowatt of capacity that form a very important percentage of the total cost of supplying electrical energy. As practically all central stations are growing, this station capacity usually has a very tangible value to the company, even though the reduction in fuel bills would not be enough to justify the change to high-efficiency lamps.

C. Q. D.

It was certain that sooner or later the wireless telegraph would have the opportunity to demonstrate its value as a means of saving life at sea. The full extent of its capacity in that direction is hardly indicated by the rescue of the passengers and crews of the collided *Republic* and *Florida*, but the illustration will suffice merely as an illustration. If this dramatic incident does not serve to convince the last doubter as to the immense utility of the wireless, nothing else will. The navies of the world are not telling all they know, and the story of what the wireless really did for Japan in her sea victories in the late war may possibly never be published; but such an event as that of last Saturday, with its sequel, proves beyond any controversy that in the wireless telegraph, and in the watertight compartment, two devices have been found reducing the perils of sea travel to a minimum. Even the submarine bell, with which the *Republic* was equipped, was also shown to have its incidental uses.

It was an Italian who gave to mankind this beautiful, practical system of etheric communication that was of such vital value in the emergency; and yet the big Italian steamer *Florida*, laden with hundreds of Italians, was without such an equipment! We can readily imagine conditions like those of the *Bourgogne* disaster whereby, the wireless not being available, lives are needlessly lost. After this experience, the maritime nations of the world will hardly allow their passenger steamers to go to sea without a duplicate wireless equipment, telegraphic or telephonic, or both. The expense is very small, and an operator will not always be necessary, if the junior officers are made to add to their study of navigation a little elementary knowledge of electricity. We hope and certainly expect to see immediate legislation or marine insurance rules aimed in this direction. In the meantime we may be permitted to congratulate Mr. Marconi heartily on furnishing this new exemplification of the service of the electrical art to mankind.

The Relative Proportions of Copper and Iron in Alternating and Continuous-Current Generators.

A recent article by Mr. A. G. Ellis in London *Electrical Engineering* compares the relative weights and costs of copper and of iron in standard British alternating-current and direct-current generators as their speeds of rotation are increased. The results arrived at in the article go to show that in alternators the amount of copper and of iron both diminish for a given kilovolt-ampere capacity up to a certain speed of rotation, and beyond that speed they commence to increase again; whereas in direct-current machines of similar capacity, the amount of copper and iron tend downward to certain limits as the speeds increase, but do not reach their minimum within practicable speed limits. Nevertheless, the alternators can be produced under normal speed conditions at lower cost than direct-current generators, mainly on account of the commutation difference.

Equivalent Circuits of Transmission Lines.

The advantage of substituting simple equivalent circuits for the complex true circuits when dealing with alternating-current problems is so great that the equivalent-circuit method is now employed in computations connected with all types of alternating-current machinery. One of the most complicated true circuit interconnections is found in the transmission line, which consists of uniformly distributed resistance and inductance, in series relation, shunted by uniformly distributed capacity. When one attempts to determine the performance of such a line under certain assumed operating conditions, the calculations become so involved when he uses the true interconnections that he is content to resort to approximate methods involving the substitution of simplified equivalent circuits. An article by Dr. A. E. Kennelly in our issue for Jan. 21 draws attention to the use of a concentrated equivalent for the true distributed capacity of a transmission line, and discusses the magnitude of the error thereby involved. Dr. Kennelly finds that, so far as concerns the capacity, each wire of a transmission system may be treated as an independent element having capacity merely between itself and the neutral zero potential point of the system. This relation exists also with reference to the resistance and inductance of each wire, so that, even on the true basis of distributed series resistance, series inductance and shunted capacity, the calculations are greatly simplified by dealing with each wire singly. Moreover, the error occasioned by considering the capacity as concentrated at the central point, or as placed in equal halves at the two ends of the line, is negligible in practical transmission systems operated at commercial frequencies. However, at greatly increased frequencies the error may be large, and, therefore, more refined methods are necessary when determining the effects of the higher harmonics in the e.m.f. wave. The latter methods are outlined by Dr. Kennelly in the article referred to above. It is worthy of note that even in the unusual case of a large value for an e.m.f. component having a frequency as high as the seventh harmonic, the approximate methods are sufficiently accurate for engineering calculation.

The Hunting of Alternators.

An instructive analysis of the interactions of two alternators in parallel is given in an article by Prof. George H. Shepard on page 271 of this issue. Having determined the value of the force which tends to keep the two machines in step, and found that it varies with the sine of the angle of displacement from the neutral position, Prof. Shepard shows that in their oscillation about a mean position the alternators are equivalent to a simple pendulum. The analogy is one that has served a useful purpose in fixing ideas as to the behavior of alternators when hunting, and in the present case it allows the author to express the exact value of the oscillating period in terms of the electrical and mechanical constants of the machines. However, as is true with all analogies, the present analogy should not be carried beyond certain limits. For instance, the period of swing of a pendulum is independent of the mass of the

pendulum, while the oscillation period of an alternator varies with the mass. A more complete analogy for alternators in oscillation is found in considering that the alternators are held in step by a flexible spring coupling—the synchronizing current; the vibrating period in this case will vary with the quotient of the mass divided by the elongational force of the spring.

By assuming the alternators to be of the two-pole type, the effect of various extreme displacements, such as 90 deg., 180 deg. and 270 deg., can easily be represented in the spring-mass analogue. Furthermore, the effect of the change in excitation of the two alternators can be shown by representing the spring as connected at each end to a crank-pin on a smooth disk mounted on the shaft of each armature, the distance from the center of the disk to each crank-pin varying directly with the field excitation of the corresponding generator. The circulating current varies directly with the elongation of the spring, but the synchronizing force depends not only on the value of the circulating current, but also on the angular displacement between the alternators, and is always exerted in a direction to bring the two machines into the position of zero displacement. It is particularly worthy of note in this connection that while the circulating current produced by a change in the excitation of two machines in parallel is "wattless," being "leading" in time with respect to the "e.m.f." of one machine, and "lagging" with respect to the other, the circulating current caused by angular displacement is a true power component, being a "motor" current with reference to the e.m.f. of the machine lagging in space and a generator current with reference to that of the other. Thus the circulating current tends to cause the field excitations to remain equal and to prevent an angular displacement between the two machines. In the mechanical analogue the spring tends to pull the two pins to similar positions on the disks, and to minimize the angular displacement between the disks.

THE OPPORTUNITY IN ENGINEERING.

The two large hydro-electric stations of the Rochester Railway & Light Company, described elsewhere, are altogether remarkable in their situations. Falls of 90 ft. or 100 ft. in a straight plunge are scarce in the East, and the opportunity of utilizing them fairly within urban territory is in the highest degree extraordinary. Rochester, however, is thus favored and Stations Nos. 4 and 5 on the Upper and Lower Falls of the Genesee respectively, are noteworthy examples of the fortunate. The latter station, now developed up to nearly 5000 kw, has the very comfortable head of 96 ft. The power house itself is on rock foundation at the base of the great rock escarpment, and the penstocks plunge downward into it. An interesting feature of the head works above is their adroit location at an angle to the flow of the stream so that the swift current may carry everything that floats on the surface by the racks and over the falls. The forebay is naturally swept clear by this means so that a little attention at the racks to rid them of slush-ice keeps the plant free of trouble. At the station itself an inclined railway is installed leading to the top of the cliff, so that material is very readily brought down to a situation otherwise almost inaccessible. The engineers seem to have taken full advantage of the situation as respects topography and to have had an eye out for every chance. The equipment of the station is singularly eclectic, but again well suited to the local situation. It includes three makes of waterwheels and the same variety in the generators.

Such departures from uniformity are very offensive to catalog engineers, but as a matter of common sense why should one not buy goods of several makes if they are desirable in quality and price, assuming, of course, that none of the machines is made at the ends of the earth or chargeable with extreme specialization in construction? Most modern generators are nearly enough alike to be quite free from idiosyncrasies that demand special care, and work together quite in harmony. The same is true of waterwheels if properly governed. The long and short of the matter is that while uniformity is in itself a good enough thing, it is not worth a stiff price. One of the noticeable features of the plant is the frequency changer used to work over the power transmitted from Niagara. The number of these devices scattered around the Niagara region is quite sufficient comment on the unwisdom of deliberately installing a great plant at a frequency impracticable for incandescent lighting. At the present time the development of thoroughly good 60-cycle synchronous converters leaves little cause for repeating the mistake elsewhere, although it has already been perpetuated in a few big central stations at heavy cost.

The No. 4 station on the Upper Falls is in the very midst of things. It works on a head of 94 ft. and is only slightly smaller in capacity than Station No. 5, although not used to so great extent save when water is plenty. It then carries some 3000 kw in railway load, besides lighting load on the three-wire network. If the catalog engineer is shocked at No. 5, he will fall in convulsions at a sight of No. 4 with its long array of stalwart old bipolar Edison generators, which—horrors of horrors!—are actually belt driven. One always likes to see prettily designed, direct-driven units, but there is no denying that a well-fitted and well-kept belt is one of the most efficient and reliable power transmitting devices known, and that peripheral velocity is the cheapest way of getting e.m.f. The use of such machines in the station in question, driven as they are by four different makes of turbines, queer as it seems, is quite justified by the facts. The station was so located that at the time of its construction belt driving was more economical than making room for direct-coupled units, and, moreover, it is used mainly at times when there is an excess of water and the slight loss in efficiency is a matter of no consequence in view of the great utilized volume going over the falls. The design was a piece of opportunism for which no apologies need be offered. It is like the case of an emergency steam station in which low first cost may be essential. Few elaborate systems of plants could not now be rebuilt with a substantial gain in efficiency, but fixed charges would often more than eat up the possible gain. Change in equipment has in the history of electrical work been responsible for a very large burden of debt, only worth incurring for the sake of clearly proved economies. Necessary changes are quite serious enough without going into still more for the sake of appearances. Opportunism has therefore reason for being if coupled with promptness in realizing genuine need for re-equipment. Any network of allied stations offers great opportunities both for radical action and for shrewd conservatism, and good engineering implies tendency in both directions. As such networks become more common, there will grow up a new and broad type of engineering that looks to economy and efficiency of the whole and lays stress on results independent of conventionalities.

Independent Telephone Meeting in Boston.

The presidents and executive officers of the leading Independent telephone companies of the United States, representing an invested capital of about $400,000,000, held a conference in Boston on Jan. 23 at the Hotel Bellevue. Mr. B. G. Hubbell, of Buffalo, president of the conference committee, was in the chair. The first question taken up was the organization of a comprehensive system for handling the long-distance traffic of the Independent companies. For this purpose a company was organized to issue interchangeable long-distance coupons which are accepted by all the Independent companies of the country. For the purpose of clearing the business, a company was incorporated in Ohio with C. Y. McVey, general manager of the Cuyahoga and the United States companies of Cleveland, as president. The corporation is called the International Independent Telephone Accounting Company, and issues a coupon book on the plan of a railroad mileage, which is guaranteed by companies in Pennsylvania, Michigan, New York, Kansas, West Virginia, Minnesota and Ohio. The companies represent about 360,000 miles of wire.

It was the sense of the conference that the present time is very favorable for the entire telephone industry, both Bell and Independent; that there is ample room for both organizations in the field, and that while no affiliation between the two is desirable or probable, the separate organizations can do their work without the industrial warfare that exists, according to opinions in some quarters. The conference went on record in favor of competition, believing that by competition a satisfactory service is alone made possible. It was unanimously agreed that there is a greater demand for telephone service than both organizations can now supply, and that the plan to be pursued by the Independents will be that of offering a good service at fair rates and letting the competition take care of itself.

Statistics were presented at the meeting to the effect that there are now about 4,000,000 Independents against 3,200,000 Bell instruments. In the Middle West the ratio was stated to be 2 to 1 in favor of the Independents, and in some sections of Ohio, Indiana and Iowa the ratio is as high as 6 to 1. Other figures presented at the meeting showed the same development in toll lines. Mr. Hubbell stated that there should be little talk about the displacement of Independent companies in the face of the growth now evident. The trouble of the latter is not to find a market for their service, but to keep up with the demands that are made on the companies by their subscribers. The natural development of the business is from 25 to 50 per cent a year, and this without the necessity of keeping in the field an expensive selling organization such as is incumbent upon every other industry. A large item of expense is thus saved. There has been little time to devote to considering the business of competitors. Mr. Hubbell stated in conclusion that the Independents now have only the friendliest feelings for those with whom they happen to be in competition. The Independent lines form an unbroken chain reaching from Albany, N. Y., to the State of Nebraska on the West.

Among those present at the conference, representing the larger companies, were: B. G. Hubbell, Buffalo, chairman; E. L. Barber, Wauseon, O.; A. E. Barker, Detroit, Mich.; F. L. Beam, Mt. Vernon, O.; J. S. Bradley, Jr., Toledo, O.; C. C. Cockerill, Jefferson, Ia.; H. D. Critchfield, Chicago; A. C. Davis, Parkersburg, W. Va.; E. B. Fisher, Grand Rapids, Mich.; G. R. Fuller, Rochester, N. Y.; I. H. Griswold, Albany, N. Y.; W. C. Hanlan, Wheeling, W. Va.; J. B. Hoge, Cleveland, O.; F. D Houck, Harrisburg, Pa.; W. R. McCanne, Rochester, N. Y.; W. J. Melchers, Alma, Mich.; M. Koehler, St. Louis, Mo.; G. R. Johnstown, Columbus, O.; C. Y. McVey, Cleveland, O.; E. H. Moulton, Minneapolis, Minn.; L. G. Parker, Louisville, Ky.; H. L. Reber, St. Louis; J. C. Reber, Dayton, O.; O. C. Snider, Kansas City, Mo.; J. G. Splane, Pittsburg, Pa.; H. C. Stifel, St. Louis; C. E. Tarte, Grand Rapids, Mich.; Charles West, Allentown, Pa.; Charles Wilson, Philadelphia; F. H. Woods, Lincoln, Neb. The conference was arranged by Bernard M. Wolf and Alfred S. Hayes, of the Metropolitan Home Telephone Company, Boston.

In the evening a banquet was held at the Parker House. The principal speakers were Messrs. Moulton, Critchfield, Hubbell, Fisher and Snider, and of local speakers, H. T. Hubbard, Boyd Jones, Mayor W. C. Wardwell, of Cambridge; B. M. Wolf, Geo. H. Tinkham, Col. S. O. Bigney, and Col Albert Clarke. Mr. A. G. Bean, president of the Metropolitan Home Company, Boston, presided, and the toastmaster was Mr. Alfred Hayes. Most of the speakers voiced the need of Independent telephone service in the East, especially in Boston, and pointed out the success of competition in the West. Mr. Critchfield stated that three principal elements in the telephone business are largely due to competition: First, the improvement of the apparatus mechanically; second, the more efficient and comprehensive service; and third, lower rates. In 14 years, he said that the Independents have put 33 per cent more telephones into service than the Bell company. More than 80 per cent of the Bell growth has come under the stimulus of competition, according to the speaker. The Independent companies comprise over 12,000 organizations, with 400,000 stockholders, and in almost every case at competitive points they operate more telephones than their rivals. Mr. Critchfield said that two telephone systems do not constitute wasteful competition because both interests, financing themselves in different fields, have been unable to raise the money to meet the public demand for telephone service. There is practically no telephone company in the country to-day which has not waiting lists of applicants for its service. It is also true in most cases that the aggregate of the highest rates charged by both companies is but slightly in excess of the rates charged by one company before the advent of competition, while the number of possible connections has been multiplied sevenfold, the service vastly improved, the treatment accorded to patrons much more considerate and courteous, and the service in every way much more efficient. The telephone properties were the only public utilities which showed increased earnings during the panic period of 1908; and second, that there have been fewer failures of Independent telephone companies in proportion to the number, within the past 12 years, than there have been failures of national banks. The future is thoroughly assured. President Moulton then pointed out the value of telephone companies as a field of investment. The next meeting will be held in Rochester, N. Y.

Lockport Patent Fraud Case.

Mr. C. E. Acker has made the following statement relating to the case of alleged patent frauds in connection with a process for detinning tin scrap, details of which appeared in these columns last week:

"This prosecution grows out of a litigation concerning certain patents or applications owned by the Tin Products Company of New York relating to a process of detinning, the parties to which were Goldschmidt and Weber, of Germany, upon the one side, and myself on the other.

"The witnesses whom it is claimed I induced to testify falsely in that litigation were examined at great length and in the minutest detail in a public hearing in which both parties were represented by attorneys, Mr. Dane, of New York, representing Goldschmidt and Weber, and Dr. Byrnes, of Washington, representing myself, and some time after their testimony had been given they were induced, by some means, to go again upon the stand and testify that they had sworn falsely in some particulars and had been induced to do so by me.

"It developed that the attorneys for Goldschmidt and Weber had pressed the District Attorney of Niagara County into their service, and that he had required the presence of these witnesses at his office and had obtained from them statements to the effect that their testimony was false, and had then immediately turned over these affidavits to the attorneys for Goldschmidt and Weber for use in the litigation. This occurred about seven months ago. Many grand juries have convened,

in Niagara County, during these seven months and these charges have not been presented by the District Attorney until now. The fact that the District Attorney first procured these witnesses to say that they falsely testified, that he turned over their statements to the attorneys for Goldschmidt and Weber for use in the litigation, that he has permitted seven months to elapse without making any move toward a judicial investigation of the charge against me and that he now acts only upon the request of the attorneys for Goldschmidt and Weber, and that he refused to permit my side of the case to be heard before the Grand Jury, are circumstances which seem to call for an explanation and characterize this prosecution as an effort to advance the interests of one of the parties to a civil litigation rather than as a performance of a public duty.

"I can only say that I am guiltless of the charge made against me, and I feel sure that when I am accorded a fair hearing that I will be vindicated."

Statement of Consolidated Gas Company on Supreme Court Decision.

At the annual meeting of stockholders of the Consolidated Gas Company of New York, on Jan. 25, a statement was made by Walter R. Addicks, vice-president, concerning the effect of the decision of the United States Supreme Court in the 80-cent gas case. Mr. Addicks said in part:

"Notwithstanding the sweeping character of its decision in declaring the pressure and penalty provisions unconstitutional and void and in holding that, on the findings of the lower court (as to which no error was found) the company did not receive a fair and constitutional return, the United States Supreme Court not only did not affirm that portion of the decree which permanently enjoined the enforcement of the pressure and penalty provisions, but it dismissed the suit absolutely; and although it did this 'without prejudice'—that is, without prejudice to the right of the company to commence a new suit to make a further test—the effect of the decree, as it now stands, will be to deprive the company (if it should ultimately be successful in having the act declared void) of the sum of about $5,000,000 heretofore deposited with the United States Circuit Court, the further sum of nearly $2,000,000, which has accrued since the final judgment of the United States Circuit Court was entered in favor of the company and to a further sum of at least $2,500,000 for each year which may elapse before the new suit can be decided, thus involving a loss of millions of dollars, if the fund is not meantime preserved; and this amount will be nearly duplicated, in the case of the allied companies, which have been depositing the 20 cents in court, in the suits brought by or against them at about the time the act went into effect.

"Although the Supreme Court thus held that the company was entitled to a 6 per cent return upon the present value of its gas properties and franchises, and that it did not actually receive 5½ per cent on the valuation found by the Circuit Court, as reduced in the case of the special franchises, by the Supreme Court, yet it refrained from holding the act to be unconstitutional and void, because (1) it thought it possible that the reduction in price 'might' cause such an increase in the consumption, without any corresponding increase in expense, as would make up the difference, and also (2) because it was of the opinion that a 'slight' reduction in the valuation of the tangible property might bridge over the difference.

"In assuming that there might be an increase in sales from the reduction in the rate, no allusion is made in the opinion of the court to the fact that Judge Hough, in the Circuit Court, had already assumed an increase in sales for the year 1906, as the result of the 80-cent rate, of more than 1,100,000,000 cu. ft. for that year alone, and that, too, without any allowance for additional distributing expenses. The increase thus assumed was more than double the average annual increase during the period from 1885 to 1905, although, during the greatest portion of that period, there was no competition from electric lighting, while the candle-power has been largely increased and the price of gas has been reduced from $1.70 to $1, and although, in 1906, the most profitable part of the lighting business in connection with the large hotels, department stores, theaters and office buildings had passed into the exclusive control of the electric lighting companies.

"All the profits derived from this extreme estimated increase in sales was included in the $3,024,492.14 of income found by Judge Hough, and accepted by the Supreme Court, without allowing for any distributing and general expenses which in the last three years have actually increased over $600,000. Increased consumption in the gas business comes largely from small consumers, where the cost of installing and inspecting meters, and the additional force required for collection and bookkeeping purposes, is very large in proportion to the new business.

"The second assumption made by the Supreme Court was that a slight reduction made in the tangible property of the company might bring about a 6 per cent return. The actual reduction, however, would amount to the large total of about $5,200,000, or more than 11 per cent of the valuation of the company's entire tangible property as found by the Circuit Court.

"It may be interesting to present, at this time, a comparative statement of the values of the property, as found and adopted by the several authorities which have considered the subject within the past four years:

VALUE OF PROPERTY OF THE CONSOLIDATED GAS COMPANY USED IN ITS GAS BUSINESS.

As found by	Intangible property.	Tangible property.	Total.	Astoria investment (additional).	Grand total.
Legislative Comm. (of 1905)	.....	.....	$30,000,000	.....	.....
N. Y. Gas. Com.	.....	.....	30,000,000	.....	.....
Special master	$20,000,000	$51,357,000	71,357,000	$12,000,000	$83,357,000
U. S. Cir. Court	12,000,000	47,831,435	59,831,435	12,000,000	71,831,435
U. S. Sup. Court.	7,781,000	47,831,435	55,612,435	12,000,000	67,612,435

NOTE.—The State Board of Tax Assessors valued the intangible property for 1908 at approximately $25,000,000.

"The New York Gas Commission stated that the company was entitled to 8 per cent as a rate of return on its property used in the gas business.

"It will be noted that the value of the property of the Consolidated company used in its gas business, as adopted by the United States Supreme Court, is $37,612,435 more than the Gas Commission stated was the value of that property. The Legislature, in passing the 80-cent act, admittedly relied upon the report of the Gas Commission, as to the accuracy of the value of such property. Eight per cent on this difference of $37,612,435 amounts to $3,008,994 per annum. This amount, divided by the gas sales for the year examined by the Gas Commission, would represent 22.61 cents per thousand, which, added to the 80-cent rate which the commission ordered, would produce a selling price of 102.61 cents upon the commission's own theory, and accepting all its other figures.

"From figures now available, the earnings from the company's gas business for the year 1908, with gas figured at 80 cents, and without any allowance for contingencies and reserve, would amount approximately to 4 per cent per annum on the value of the property as assumed by the United States Supreme Court."

New England Water Powers.

The Boston Merchants' Association has passed a resolution urging action to prevent the destruction of forests on the high watersheds of the White Mountains. It is stated that there is over $400,000,000 invested in manufacturing interests on streams which flow from the White Mountains, that these interests employ about 200,000 operators, pay wages of $60,000,000 a year and have a yearly output of about $300,000,000. On the Connecticut River alone there are 3000 mills. It is pointed out that the government has already spent $3,000,000 in aiding navigation on the several rivers tributary to the White Mountains, all of which will be injured, if not destroyed, by the river channels silting up through erosion among the mountains.

Public Utilities Commission Recommended for Connecticut.

Mention has been made in the *Electrical World* of the draft of a bill providing for the creation of a public utilities commission in Connecticut. This bill was prepared by a commission appointed by the last General Assembly of the State to consider the existing laws and to recommend remedial legislation or any legislation on the subject which it might deem desirable for the public interest. This commission has presented its formal report to the new Legislature, together with the draft of a bill, whose passage it recommends.

The commission reports that it reached the conclusion that it would be desirable to vest in a permanent public utilities commission the following powers and duties:

1. To grant franchises to public service corporations.
2. To supervise the condemnation of land and construction of fixtures by these corporations in so far as the same affect the public safety or interest.
3. To supervise the capitalization of these corporations.
4. To ascertain the facts relating to the financial conditions of these corporations; the physical conditions of their plants and equipments, and the cause of accidents resulting from their operation.
5. To supervise their operation in so far as the same substantially affects the public safety.
6. To fix the rates chargeable when existing rates are unreasonable.

The commission expresses the opinion that "the duties of a public utilities commission should be purely supervisory and not managerial." The commission believes that the public is justified in supervising the operation of public service corporations so far as it is necessary to enforce compliance with the obligations "to render to the public adequate service at reasonable rates" and "to furnish service to all members of the public upon equal terms and without discrimination against or in favor of any." While the powers of a permanent commission "ought to be adequate for that purpose, beyond this point the management of the affairs of these corporations ought, in the opinion of the commission, to be left to the persons investing their money therein."

The commission then takes up in order its recommendations as given in the foregoing.

By the term "public service corporations" is meant all private railroad, street railway, gas, electric light, electric power, water, express, telephone and telegraph corporations. Corporations organized for the sole purpose of developing water power are not included.

The commission believes that a small permanent commission would be better adapted to the exercise of the power to grant special rights than the General Assembly, which exercises this power by the present system of special charters.

In discussing the second recommendation, the commission says: "Construction on private property should be supervised, as the safety of the public may be affected by such construction. While it is for the real interest of a corporation to render its construction safe, yet this has not always been the case; there is much construction in the State which is unsafe. Many instances might be cited. High-power electric wires cross and are crossed by telephone wires at various points throughout the State with no protection from contact of the wires if the higher wire should fall."

Supporting its recommendation that a permanent commission be given authority to supervise capitalization, the commission says that many of the public service corporations in Connecticut have been largely over-capitalized. After comparing figures of capitalization in Massachusetts and Connecticut, the commission adds:

"These figures show that the Massachusetts capitalization per mile of street railway is about two-fifths that in Connecticut. This is not due to better construction or to a larger proportion of double-track lines in this State, as the percentage of double-track street railway mileage in Massachusetts is slightly larger than in this State, and it is believed that the construction of the street railways in Massachusetts compares favorably with that in this State.

"There is no apparent reason why a similar supervision in this State should not effect similar results in so far as the construction of lines in the future are concerned. Such supervision would not be detrimental to the legitimate interests of the corporations, but would add to the value of their securities by the practical guarantee that the proceeds of such securities would be used in building up and developing their properties for the benefit of their stockholders and of the investing public instead of for the benefit of the professional promoter.

"If such corporations were properly capitalized the saving would enable managers to maintain their properties in a much higher state of efficiency, and hence of safety; would provide means and credit for extending new lines into unoccupied territory, with a view to future rather than immediate profits; would give a longer ride and better transfers for a single fare; and would provide for a larger fund for wages, thus securing better help, greater safety for passengers, and avoidance of labor troubles, with attendant strikes."

The power to examine the financial condition of the corporations, the commission argues, is only extending the present policy of the State, while "the power to examine and ascertain the physical condition of the plants and equipments of these companies is necessary for the safety of the public and of the employees of the company."

The commission believes that a disinterested tribunal should have the power to determine "if and when an unreasonable rate is charged." The commission "does not attempt to state or intend to intimate that the rates charged by public service corporations in this State are reasonable or unreasonable. What constitutes a reasonable rate in any instance can only be determined by a careful investigation and consideration of all the circumstances and conditions which bear upon the question."

Besides the new legislation recommended by the commission, it suggests a recodification of existing legislation relating to public service corporations.

The commission which made the report consists of Messrs. Marcus H. Holcomb, Thomas D. Bradstreet, Charles Phelps, P. H. Woodward and Washington F. Willcox. Ralph O. Wells was clerk of the commission.

United States Water-Power Regulation.

In a report transmitted to Congress by President Roosevelt, accompanied by a message, the National Conservation Commission gives an estimate of the water power of the United States. It is stated that the water power now in use aggregates 5,250,000 hp, that the amount running over government dams and not used is about 1,400,000 hp, and that the amount reasonably available not only equals the entire mechanical power now in use, but is enough to operate every mill, drive every spindle, propel every train and boat, light every city, town and village in the country. The fuel production for 1907 is stated to be 395,000,000 tons of bituminous and 85,000,000 tons of anthracite coal. The production of petroleum was 166,000,000 bbl. It is predicted that the coal deposits will be exhausted by the middle of the next century.

The report states that the permanent welfare of the nation demands that its natural resources be conserved by proper use of them, and that to this end the State and Nation can do much by legislative example; that private ownership in natural resources is a public trust, and should be administered in the interest of the people as a whole; and that the present need is that every citizen, the State and Nation unite in an effort toward the conservation of natural resources. An organization is recommended to which all agencies, State, national and municipal, associate and individual, may unite in a common effort to this end, but the immediate creation of a national agency is essential. President Roosevelt in his message asked for an appropriation of $50,000 to carry out the recommendations of the commission.

Massachusetts Railroad Commission Reports Against Steam and Trolley Mergers.

The Massachusetts Railroad Commission made public on Jan. 18 an important report on the question of steam and electric railway relations in the State, addressed to the Legislature in response to a resolution of the Senate asking for the board's opinion upon these relations, upon the expediency of permitting the Berkshire Street Railway to purchase the franchise and property of the Bennington & North Adams Street Railway Company, and upon the expediency of permitting any railroad corporation chartered under the laws of Massachusetts to become or continue a stockholder in the Berkshire Company.

After an exhaustive review of steam and electric railway development in Massachusetts, and a survey of legislation bearing upon mutual relations of steam and electric railway companies, and the merger of steam roads, the board concludes that "the established policy of the State with respect to keeping separate and distinct the railroads and street railways of the commonwealth is a system of efficient administration entirely consistent with the public interest. The board is therefore of the opinion that no general legislation is now necessary to change or modify the existing laws as to the relations between these two classes of public servants." Regarding the permitting of any railroad to become a stockholder or to continue as one in the Berkshire line, the board is of the opinion "that the enactment of legislation permitting this company to be acquired in any form of holding by a steam railroad would not be an exception but a violation of the general policy of the commonwealth. Private capital can be secured for the construction of additions to and extensions of street railway or other lines in Massachusetts when sound and reasonable public demands exist. The past experience of Berkshire County has confirmed this view. A policy that would legalize the control by a steam railroad of this street railway, solely upon the ground that it would make available superior financial resources, would also, if carried to its logical conclusion, result in the control of all street railway mileage in the commonwealth."

The board sees no valid reason why the Berkshire should not purchase the Bennington, with suitable safeguards. A chapter in the report deals at length with future possibilities in electric transportation in Berkshire County, and points out several routes of travel which might be logically developed to afford better facilities than now obtain.

The board finally notes a progressive street railway development in Massachusetts, and points out that the two systems of transportation, steam and electric, are each fulfilling their functions as public servants. "Each within its distinct field of service should receive the most favorable consideration of the General Court. Neither, however, should absorb the other, in whole or in part, until experience has completely demonstrated that only by the adoption of such a policy can Massachusetts continue to secure the full benefits of two great public utilities."

The Navy at the Chicago Electrical Show.

The noon-day meeting of the Chicago Electrical Club was held on Wednesday, Jan. 20, in the café of the Coliseum. This day was known as the "Electrical Club Day" of the Chicago Electrical Show which is being held at the Coliseum, Chicago, from Jan. 16 to Jan. 30.

The meeting was one of unusual interest, and was well attended by the members of the club. The principal speaker was Lieut.-Commander E. T. Witherspoon, U. S. N., in charge of the Chicago and the Milwaukee recruiting stations. Mr. Witherspoon in a general way gave a synopsis of the uses to which electricity is put on a modern battleship. He said electricity has become as important in the performing of necessary duties in the operation of battleships, and the firing of guns, etc., as any other element that has ever added to the efficiency of these ships. This applied not alone to the apparatus found on the upper decks, but also to the ship's equipment on each of the lower decks, and even down into the coal bunkers and firing rooms. Without the use of electric motors forced draft, such as is needed on a modern battleship, would, he said, be impossible, and the efficiency of the ship in time of war would be correspondingly decreased. He asked the representatives of electrical manufacturers present to visit the model battleship which had been installed at great expense in the Coliseum Annex, and to become better acquainted with the apparatus shown. He said one of the objects of his appearing before the club was to interest the electrical men of the West and Middle West in the methods employed by the government in placing contracts for furnishing electrical equipment for the U. S. Navy. During the balance of the Electrical Show he would have on exhibit several sets of specifications for electrical apparatus as sent out by the U. S. Government, and would gladly furnish information to make manufacturers of electrical machinery better acquainted with the best methods to follow in making bids for electrical apparatus for modern battleships. Heretofore, he said, a large percentage of electrical contracts have been placed in the Eastern States, but he thought the only reason for this was that the manufacturers of the Central West are not well enough acquainted with the naval electrical equipment to bid successfully for the business.

Meeting of the Metropolitan Electrical Trade Association.

At the annual meeting of the Metropolitan Electrical Trade Association, held on Thursday, Jan. 21, at the rooms of the Modern Science Club, Brooklyn, Mr. John P. Bonney, of Thompson-Bonney Company, was unanimously chosen president of the association for the current year, and the following were elected members of the board of directors, viz.: Messrs. John P. Bonney, Louis L. Brown, George M. Wheeler, John F. Jordan, W. C. Bloomer, Charles A. Borne and George Weiderman.

James F. Hughes, of Charles A. Borne Company, the retiring president, congratulated the members on the spirit of concord and co-operation shown during the first year of the association's existence and gave emphatic expression to his firm confidence that the association will thrive under the leadership of the new president.

The annual dinner of the association will be held at Edgett's on Thursday, Feb. 18. Mr. Leopold F. Luedecke, 45 York Street, Brooklyn, was unanimously re-elected secretary and treasurer.

Edison Returns to Quadruplex Invention.

A patent was issued Jan. 19 to Thomas A. Edison on an improvement to the quadruplex telegraph system. It is stated that one of the defects which has always existed in the quadruplex system is that when the armature of a neutral relay employed in that system is drawn by the full current strength, and a reversal of the current takes place, the armature momentarily falls away from the front stop with a likelihood of producing a "kick" or false signal in the local sounder. While numerous suggestions have been proposed for overcoming this defect, none, it is stated, has in practice and on lines of considerable length been entirely satisfactory. The invention of the patent consists in combining with the neutral relay a rectifier, such as the aluminum rectifier, by means of which, although the current on the line may be reversed, the polarity of the current influencing the neutral relay will remain unchanged. It is pointed out that the aluminum rectifier presents a practically perfect insulation of one polarity without appreciably resisting currents of the opposite polarity, and therefore it becomes possible to arrange a number of cells of such rectifier in such a manner that a current of reverse polarity will be so commutated as to pass through the neutral relay always in the same direction.

French Letter-Telegrams.

Recently a note appeared in these columns on the subject of French letter-telegrams, and also a letter from Mr. Patrick B. Delany commenting on this telegraphic innovation. In a consular report, Consul-General Washington states that the service was inaugurated on Dec. 7, when from certain offices in France and Corsica, letter-telegrams paid in advance were transmitted by wire during the night at the rate of 1 centime (⅕ of a cent) the word. No messages are forwarded at a charge of less than 50 centimes (10 cents). The messages are sent out as mail matter by the early deliveries.

Although messages are only forwarded during the night after 9 o'clock, they may be deposited after 7 o'clock in the evening, and at designated offices, which are open until midnight, until 11 o'clock. The following cities are provided with the service until midnight: Paris, Bordeaux, Boulogne-sur-Mer, Brest, Calais, Cherbourg, Le Havre, Lille, Lyon, Marseilles, Montpellier, Nancy, Nice, Roubiax, Toulouse and Tourcoing, the principal offices of which are open until midnight, and the minor offices until 11 o'clock.

The following cities will have the service until 11 o'clock: Agen, Aix-en-Provence, Ajaccio, Amiens, Angers, Arras, Avignon, Bastia, Bayonne, Besançon, Béziers, Biarritz, Boulogne-sur-Seine, Caen, Cambrai, Cannes, Carcassonne, Cette, Châlons-sur-Marne, Clermont-Ferand, Dijon, Dieppe, Douai, Dunkerque, Elbeuf, Grenoble, Laval, Levallois-Perrett, Limoges, Lorient, Mâcon, Le Mans, Montauban, Montecarlo, Nantes, Narbonne, Neuilly-sur-Seine, Nimes, Orléans, Pau, Perpignan, Rheims, Rennes, Rochefort, Rouen, Saint-Etienne, Saint-Nazaire, Saint-Quentin, Toulon, Tours, Troyes, Valence, Valenciennes and Versailles.

It is added that the letter telegram is an experiment, and its continuation will depend upon the extent the public avails itself of this opportunity. Considering the low rate provided, and the immense convenience to business interests that admit of lengthy messages being sent at the close of a business day and received early the morning following at points two or more days distant perhaps by ordinary mail facilities, as is the case when letters are sent from Corsica to Paris, and 20 hours when sent from the northeastern section to the capital.

Between cities not on a main line connection much practical convenience will result, since the length of time required by ordinary postal service across even comparatively small distances in France not directly connected is often too great to admit of a letter mailed at night reaching its destination on the morning of the following day. It is estimated that an appreciable portion of the patronage will come in this way. The interest demonstrated generally by business men indicates that there is every prospect of financial return that will warrant this method being decreed a permanent service.

Meeting of the Empire State Association.

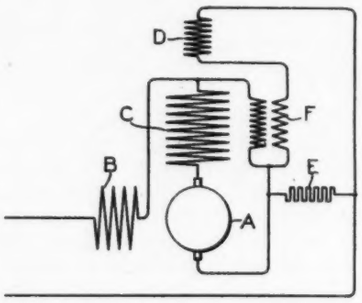
The adjourned annual meeting of the Empire State Gas & Electric Association of New York State was held on Jan. 15. At this meeting a revised constitution and by-laws were adopted and officers for the coming year were elected. The officers and members of the executive committee are as follows: President, William T. Morris, Associated Gas & Electric Company; first vice-president, M. J. Brayton, Utica Gas & Electric Company; second vice-president, R. M. Searle, Rochester Railway & Light Company; treasurer, T. O. Horton, New York & Richmond Gas Company; executive committee, class 1909: Walter R. Addicks, Westchester Lighting Company; P. T. Glidden, Binghamton Light, Heat & Power Company; G. W. Curran, Syracuse Lighting Company; executive committee, class 1910: T. O. Horton, New York & Richmond Gas Company; J. J. Humphreys, Jr., Brooklyn Borough Gas Company; F. L. Dame, Geneva-Seneca Electric Company. The present secretary was re-elected.

No papers were presented. The association has taken offices in the United Engineering Societies Building and will occupy them about Feb. 1.

Non-Sparking Single-Phase Commutator Motor.

In order to provide a proper value of voltage for impressing upon the commutating-pole winding of a single-phase series motor, Mr. Marius C. A. Latour, according to a patent issued Jan. 12, subjects this winding to two e.m.fs. in the proper time-phase position, oppositely directed. One e.m.f. varies directly with the current taken by the machine, while the other varies with the product of the current and the speed of rotation. The latter e.m.f. is smaller than the former and is opposed to it in direction, so that the resultant e.m.f. decreases with increase of speed.

The arrangement proposed by Mr. Latour is shown in the accompanying illustration, where *A* is the armature winding, *B*



NON-SPARKING SINGLE-PHASE COMMUTATOR MOTOR.

is the main field coil, *C* is the stationary compensating winding for opposing the armature m.m.f., *D* is the commutating pole winding, *E* is a resistance in series in the armature circuit, and *F* is a transformer in parallel with the armature and compensating coils. The e.m.f. across *E* is approximately in time-phase with the motor current, as is also the e.m.f. at the secondary of the transformer *F;* the resultant (difference) of these two e.m.fs. is impressed upon the coil *D,* so that the flux in the commutating pole is approximately in time-quadrature with the armature current and the main field flux, and it decreases automatically with increase of speed.

The Humming Telephone.

The *Proceedings* of the American Philosophical Society for 1908 contains a paper by Dr. A. E. Kennelly and Mr. Walter L. Upson, entitled "The Humming Telephone: A Contribution to the Theoretical and Practical Analysis of Its Behavior." It is stated that the fact that the telephone receiver held either in contact with or close to the face of the transmitter may cause the production of a hum or singing tone appears to have been observed by Mr. A. S. Hibbard, and first published in a paper read in 1901 by Mr. F. Gill before a meeting of the Dublin Section of the (British) Institution of Electrical Engineers.

In many cases it is only necessary to lift a receiver from the hook and hold it face to face to the transmitter in order to produce a hum which may be so loud as to be heard in a distant room through several partitions. The present paper gives the result of a large number of experiments made with a view of establishing a theory of the phenomenon. Among the conclusions are that the mean frequency of the humming telephone note is determined solely by the receiver diaphragm and its natural free rate of vibration. On the other hand, the range of pitch vibration and the breaking conditions are determined by the transmitter. For systems that are weak, however, either electrically or acoustically, the range of pitch above or below the mean would be rather small. The primary current is ordinarily a minimum at the mean frequency and a maximum at the break. The paper includes a mathematical discussion of the various elements entering into the phenomenon from which conclusions are deduced as to the relations between it and the frequency and the circuit capacity and conductance.

Convention of the Northwestern Electrical Association.

THE seventeenth annual convention of the Northwestern Electrical Association was held at Hotel Pfister, Milwaukee, Wis., Jan. 20 and 21, 1909. The meetings were presided over by President P. H. Korst, of Janesville, who was directly responsible for the program this year and to whom much of the success scored by the convention is due. After the meeting was called to order Mr. Korst delivered his presidential address.

President Korst reviewed briefly the history of the association, which was organized in February, 1893, at a meeting at which there were present half-a-dozen central-station men and one supply man. Until 1901 two meetings were held each year. Referring to the business situation he said that each month the field grows larger and that the advent of the tungsten lamp has placed electric lighting on such an economical basis as to cost to users that many new fields are now opened up that formerly were barred on account of cost. Power work is of growing importance and Mr. Korst said that he is familiar with a plant which by its means has attained an average low factor of 50 per cent. There are many industries that can regulate their working hours so that no power and not much light will be used during the peak-load hours during the winter months, providing sufficient inducements can be offered to make it an object for them to organize their operations accordingly. A few such industries in the territory of the association are creameries, canning factories, cold-storage warehouses, refrigerating plants, some of the wood-working industries and pumping city water. Electric laundry irons, toasters, chafing dishes and coffee percolators are also very helpful. Electric cooking on a practical scale has not in the past been very successful owing to the high cost of utensils and electrical energy, but he said that we can soon expect a combination of a fireless cooker with an electric heating element that will be so economical in current as to justify its use even at the lighting rate. This cooker will boil, bake, broil, roast and, in fact, do almost any manner of cooking and with the ordinary cooking utensils.

Referring to the Railroad Commission of Wisconsin he said that the association should feel proud of its personnel and its employees, and render them all possible assistance in carrying on the work. Any company desiring to deal justly with its customers need fear no injury from the commission, but, on the other hand, will be benefited since customers, through it, will be assured that good service is being rendered at reasonable rates, that the meters are accurate, and that the company is required to improve any part of the service or equipment found deficient. While small companies will be inclined to object to the refinement of accounting required by the commission in order to obtain the necessary information for it to act intelligently when complaints are filed, the benefit to the company itself from this additional information will more than offset the extra cost and trouble. The information, moreover, will enable citizens in towns having municipal plants to judge as to the economical operation of these plants by comparison with the reports of privately-owned plants. Uniform accounts will also enable central-station men to compare costs of operation, receipts per head of population, etc., thus aiding in forming rational plans for lowering cost of operation and getting new business.

Mr. J. S. Allen, of Lake Geneva, chairman of the committee appointed last year to consider consolidation with the Wisconsin Electric & Interurban Railway Association, reported, contrary to the apparent drift of events at the last convention, against such consolidation on the ground that the work of the two associations does not to any extent overlay or interfere. After some discussion on the report no action was taken.

Formal invitations were received from the Chicago section of the Illuminating Engineering Society to attend its meeting in Chicago, Jan. 22, and from the Electrical Trades Exposition Company to attend the Electrical Show in Chicago. An invitation was also extended to visit the Allis-Chalmers Company shops the following morning. All these invitations were accepted with thanks. The president called upon Mr. C. H. Williams, now general manager of the Northern Colorado Power Company at Denver, Col., and an ex-president of the association, for a few remarks.

Mr. George B. Wheeler, general manager of the Chippewa Valley Railway, Light & Power Company, of Eau Claire, Wis., brought to the attention of the association a circular advertising an automatic cut-out which was being addressed to central-station consumers and which is so worded as to create an altogether false impression as to the dangers of electric light wiring to life and property. The convention expressed its disapproval of such literature by appointing Messrs. Wheeler and Gonzenbach a committee to consider the matter and draw up resolutions of censure.

The convention then drifted into an informal discussion of matters pertaining to legislation and public utility regulation in Wisconsin. The commission in whose hands this regulation has been placed is apparently admitted by everyone to be men of a high order of intelligence and integrity. Its rulings have always been very fair and conservative, both from the public and corporation standpoint. The remarkable fact was brought out, however, that there is a movement on foot originating with the city officials of Manitowoc, Wis., to get the present commission law repealed or modified, the present arrangement evidently not suiting some politicians. The commission law takes regulation out of the hands of local city councils and places it with the commission which has in its employ a large number of experts. The public utilities are therefore being regulated by a body of men who understand the business thoroughly, rather than by local councilmen who do not understand it. This is not at all to the liking of some of the city officials, and attempts are being made to have the law changed at this session of the Legislature. As was brought out by the discussion at this session, the electric lighting companies are in a peculiar position as regards their attitude toward the present law. While they believe that the present commission is of benefit both for the companies and the public, and while the acts of the commission so far have been unquestionably fair and conservative, it was seriously argued that too enthusiastic support of the present commission law by the public service companies might in itself be considered sufficient ground for opposition to it by some legislators.

Wednesday afternoon a paper was read by Mr. Henry Schroeder, of the General Electric Company, on "Series Tungsten Lighting." This brought out a discussion on the actual and theoretical economies to be obtained by the use of tungsten lamps in replacing series carbon lamps on street-lighting circuits.

Mr. S. E. Doane, chief engineer of the National Electric Lamp Association, read a paper on "The Commercial Development of the Tungsten Lamp." In connection with the extended discussion on the tungsten lamp situation which this paper elicited, an announcement was made of a tungsten sign lamp of 4 cp, taking 5 watts at 10 volts, and having a life of about 2000 hours. It is intended to be operated from a small transformer located at the sign, and having a 10-volt secondary.

Mr. F. W. Willcox, of the General Electric lamp factory, also called attention to the new 40-watt tungsten lamp which is now being made in small bulbs so that it can be placed in regular 16-cp lamp sockets. This lamp lists at 10 cents less than the large-bulb, 40-watt lamp.

The discussion on tungsten lamps was followed by a paper by Mr. Ludwig Kemper, manager of the Albert Lea (Minn.) Light & Power Company, on "Cost Keeping in the Contracting Department," an abstract of which is printed elsewhere. He described a system of keeping records of supplies and labor used in wiring and piping contracting in a central-station company doing $10,000 worth of contracting business annually. By the employment of a storekeeper his company had stopped so many leaks that the contracting business, instead of showing an annual loss, was showing a good annual profit,

with about the same gross business. He therefore fully indorsed the idea of having a storekeeper and a proper system, even in a small company, with that volume of contracting business. The storekeeper does other work, such as testing and repairing meters and arc lamps which are brought in to him.

On Thursday morning the Allis-Chalmers Company provided a special car from the hotel to West Allis, where an hour was spent by the members in going through the great shops of that company. This trip took up practically all the morning.

The afternoon session was given over to matters pertaining to the regulation of electric service by the Wisconsin Railroad Commission. A paper on "The Control of the Adequacy of Electric Service" was read by Mr. F. A. Vaughn, of the Milwaukee Electric Railway & Light Company, of which an abstract appears elsewhere. He took up in detail various rules regarding the adequacy of electric service, formulated by the Wisconsin State Commission, and gave the methods which his company is pursuing in testing and keeping records of meters, voltage regulation and other matters having directly to do with consumers' service.

The convention was then fortunate in listening to an address by Prof. B. H. Meyer, chairman of the Wisconsin Railway and Public Service Commission, whose remarks were very reassuring to the members as to the fairness of the treatment they would receive at the hands of the commission. He came out strongly in favor of developing the profit-sharing idea suggested in the public-service law, which makes it possible to increase dividends when there is also a reduction of rates. Both these papers were discussed at length, and many questions asked regarding the attitude of the commission on various matters.

PRESIDENT ERNEST GONZENBACH.

The officers elected for the ensuing year were as follows: President, Mr. Ernest Gonzenbach, general manager of the Sheboygan Light, Power & Railway Company; first vice-president, Mr. George B. Wheeler, secretary and general manager of the Chippewa Valley Railway, Light & Power Company, Eau Claire; second vice-president, Mr. Roger N. Kimball, Kenosha Gas & Electric Company; secretary and treasurer, Mr. John S. Allen, manager Equitable Electric Light Company, Lake Geneva, Wis. Executive committee: Messrs. P. H. Korst, of Janesville; Clement C. Smith, of Milwaukee, and J. H. Harding, of La Porte, Ind.

Mr. Ernest Gonzenbach, who was elected president of the Northwestern Electrical Association, is vice-president and general manager of the Sheboygan Light, Power & Railway Company, Sheboygan, Wis. Although Mr. Gonzenbach's reputation has been largely made in the electric railway field, he has demonstrated since taking hold of the Sheboygan property his ability also to handle electric lighting problems in a broad way, and is one of the few managers who combine well the ability and willingness to give attention to details of both railway and lighting work. For the past three years he has taken a prominent part in the proceedings of the Northwestern Electrical Association. Mr. Gonzenbach is Swiss by birth and education, but came to this country immediately after leaving school. After an electrical experience in power-house work in Chicago he passed through the Thomson-Houston expert course at Lynn, Mass. In 1895, as electrical engineer in St. Johnsbury, Vt., he constructed several electric light and transmission plants in that vicinity. In 1898 he went with the Westinghouse Company, and in 1900 became electrical engineer of the Albany & Hudson Electric Railway, from which he went to Chicago to take a similar position with the Aurora, Elgin & Chicago Railroad, then being constructed. He has been at Sheboygan as general manager since Jan. 1, 1905.

Artificial Electric Lines.

In a paper published in the *Proceedings* of the American Academy of Arts and Sciences for 1908, Dr. A. E. Kennelly treats mathematically the subject of "Artificial Lines for Continuous Currents in the Steady State." The subject is developed under the heads of types of artificial lines; fundamental relations and notations; artificial line free at far end; line grounded at far end; best resistance of receiving instruments; imitative accuracy of artificial lines; equivalence between single-section artificial line and uniform smooth line.

The conclusions are that every artificial line composed of similar mid-leak sections, carrying either continuous or alternating currents, may be reduced trigometrically to its equivalent smooth line, and reciprocally. The resistance, current and voltage at the various junctions and leaks along the lines are simple hyperbolic sections of the analysis. Every smooth line in the steady state carrying either continuous or alternating current may be externally completely replaced by one, and only one, single-section mid-leak artificial line; or by one, and only one, single conductor with equal terminal leaks, and reciprocally. This proposition is stated to have numerous applications in telegraphy, telephony, power transmission and distribution.

Electrical Attachments to Gasoline and Oil Engines.

Five joint patents were granted Jan. 19 to Harry Hertzberg, of New York City, and A. A. Low, of Horseshoe, N. Y., on the application of electrical heat to the vaporizer of gasoline and oil engines. The specifications state that such an engine cannot be started quickly when a combustible mixture of air and oil is first supplied to the cylinder owing to the fact that the oil has a tendency to condense by contact with the cold surfaces of the cylinder and its head. Ordinarily the cylinder is heated by some external appliance or flame, which is stated to be objectionable for a number of reasons. The object of the invention patented is to overcome these objections and to vaporize quickly the liquid combustible when starting and while operating a vapor engine, thus requiring only one kind of grade of fuel to be used in the operation of the engine. Two kinds of devices are described for this purpose, one being used internally and the other externally. In both cases the vaporizing surface is heated electrically to the required temperature in a very brief time. It has been found that in a few minutes the engine by this means may become sufficiently heated up to vaporize the successive charges of fuel, after which the preliminary electric starting device is discontinued from service. Another patent on a vaporizer of the same type was also on the same date granted to A. A. Low individually.

On the same date a patent was granted to F. S. Perrin, of New York, on a speed-limiting device for electrically ignited explosive engines. This consists of a centrifugal arrangement like a speed indicator, by means of which when the speed of an automobile exceeds a predetermined amount the primary of the sparking coil is cut out.

Appointments to Harvard Engineering Faculty.

The appointments of Prof. George F. Swain and of Prof. H. E. Clifford, both of the Massachusetts Institute of Technology, to the Graduate School of Applied Science at Harvard University, has been just announced. The appointments will be effected next September. Professor Swain is at present in charge of the department of Civil Engineering at the Institute of Technology and has carried on much teaching and notable engineering work at that institution for a number of years. Professor Clifford was born in Lowell in 1866, and was graduated from the Institute of Technology with the degree of bachelor of science in electrical engineering in 1886. He immediately joined the teaching staff and has since been continuously connected with the institute. He was appointed assistant professor of electrical engineering in 1895, professor in 1904, and was acting head of the department from 1904 to the accession of Prof. Dugald C. Jackson in 1907. Professor Clifford is one of the board of directors of the American Institute of Electrical Engineers and is a past-chairman of the Boston section. He is a fellow of the American Academy of Arts and Sciences and of the Circolo Mathematico di Palermo.

Both of these appointments have been made in view of the approach of the first payment of $1,000,000 to Harvard University from the great McKay bequest for applied science. It is stated that other appointments to the engineering departments are to follow. Inasmuch as engineering has occupied a prominent department of Harvard University for some time past, it is expected that, with the impetus given by the McKay bequest as it comes into operation, a graduate school of applied science will be built up at Harvard second to none in engineering, mining and metallurgy, architecture, forestry, chemistry and physics.

Cost of Installing Small Central Stations.

The Massachusetts Gas and Electric Light Commission has approved the issue of stock by the Lawrence Gas Company to the amount of $600,000 par value at a market value of $160 per share to cover the payment of promissory notes and the cost of additions to the gas and electric plants. The company has expended $385,133 on construction work in its electrical department in the period between July 1, 1906, and Oct. 31, 1908, and estimates that the cost of completing the work will be $39,355.

The recent electrical improvements comprise the following items:

EDISON ELECTRIC PLANT.

The inside dimensions were 91 ft. long, 36.5 ft. wide, height 17 ft. 8 in.; front bay, 36 ft. x 10 ft. The work existed of building new walls on three sides of the station, erection of bay across full width of building at front for feeders; lining of walls inside with face brick; laying concrete foundation; excavating for basement; building air chambers for basement; construction of subway for ducts, and erection of steel frame, floor and roof.

Building costs.		
Excavating and back filling	$694	
Concrete foundations	956	
Brick walls	5,026	
Roof	3,143	
Floors	1,379	
Total	$12,756	
Machinery (Edison station).		
Rotary converter, 500-kw, with transformer, regulator, blower and switchboard (including $193 insurance, freight, teaming and labor)		$12,804
Rotary converter foundations:		
Excavating	$106	
Concrete footings	492	
Brickwork	546	
		1,144
Additional blower set (10-hp) 60-cycle motor		647
Additional switchboard equipment		742
Total		$14,596
Supplies.		
Conduits in basement and subway to street:		
1260 ft. ducts	$129	
4629 ft. No. 0 stranded high-tension cable	1,252	
Excavation, teaming and concrete	800	
Wire, supplies and machine work	$96	
Company's labor	313	
		$2,592
Sundry labor, supplies and engineering		1,817
		$22,688
Labor, setting up blower plant	$19.56	
Labor, wiring blower plant	34.72	
Labor on new busbar	38.40	
Fittings, insulators, etc	30.47	
	$123.15	$123
Total Edison electric plant		$35,568

SOUTH SIDE ELECTRIC PLANT EXTENSION.

Balance of cost of completing work (building)		$9,122
Machinery		20,583
Including the following items of interest:		
Damper regulator	$75	
7-10" valves for circulating water system	284	
2-6", 5-8", 2-12" valves for main steam system	667	
1000 ft. 500,000 c. m. cable	543	
Total, South Side plant extension		$29,706

ELECTRIC LINES.

Total cost $37,381

Items of interest.

No. B & S.	Wire, length.	Cost.
00	33,700 ft.	$3,697
0	49,974 ft.	5,051
2	19,659 ft.	1,083
4	39,030 ft.	1,414
6	181,013 ft.	4,286
8	34,617 ft.	631

Poles (kind not stated).			Cross arms.			Mast arms.	
Size.	Number.	Cost.	Size.	Number.	Cost.	Number.	Cost.
30 ft.	153	$613	6 pin	981	$833	31	$310
35 ft.	125	690	8 pin	434	434		
40 ft.	16	112	10 pin	79	95		
45 ft.	5	43					
50 ft.	7	84					
55 ft.	2	30					

Hoods.		Hangers.		Switches.	
20	$80	30	$21	278	$14

UNDERGROUND CONDUIT.

Conduit.	
Total length of street covered, feet	2,140
Total duct, feet	20,119
Size of duct, 3¼ in. inside, vitrified clay, ducts laid in concrete:	
14,619 duct feet for mains	$875.99
5,236 duct feet for services	287.98
264 duct feet for bends for services	58.50
Conduit wrappers	24.35
Total	$1,246.82
Laying ducts (cement, $270; sand, $98; broken stone, $192; lumber, $241)	801.35
Labor and teaming	2,530.12
Total	$4,578.29
Conduit cost, laid:	
Cables, 49,859 ft., cost	$11,805.00
Cables drawing in 49,859 ft., cost	1,710.00

Electric extension, 1907, cost.

Enlargement of South Side plant. Original size of boiler house, 48 x 51 ft., enlarged to 95 x 81 ft.; foundations, steel beams and concrete; walls, brick and steel; roof, steel and tiles; floor, concrete and brick. Height, 33 ft. 4 in.

Dynamo house: Brick, steel and concrete. Original size extended by 28 x 47 ft. addition. Height, 42 ft.

Economizer house: Length, 91 ft. 7 in. x 26 ft. 6 in. Height, 32 ft., with addition for mechanical draft, 15 ft. 6 in. x 12 ft. 3 in. Brick, steel and concrete.

BOILER HOUSE.

Total building cost, boiler house	$12,561
Total machinery cost, boiler house	36,431
Machinery includes following items of interest:	
3 604-hp B. & W. boilers, with superheaters, erected	$25,717
2 12 x 7½ x 15 in. boiler-feed pumps, erected	1,546
1 Cochrane feed-water heater, erected	1,250

GENERATOR HOUSE.

Total building cost	$3,632
Total machinery cost	82,151
Machinery includes following items of interest:	
1 2250 Curtis turbine, $58,000.	
1 2250 Curtis turbine foundation, $1,188.	
1 2250 Curtis turbine foundation (excavating and back filling), $524.	
1 2250 Curtis turbine: Freight, $375.90; teaming and labor, $184; sundries, $43.54.	
Total cost of turbine erected, $58,604.	
Condensing auxiliaries, $11,547; including incidentals, $11,907 (one 7500 sq. ft. surface condenser and pumps).	
Condenser and auxiliary foundations, $491.	
75-kw turbo exciter set and foundation: Turbo exciter, $158; foundation, $2,887.	

ECONOMIZER HOUSE.

Building, cost $5,615; machinery, $13,792, including 2000-hp Sturtevant economizer at $10,700 (also induced draft plant, 3000-hp).

Winnipeg Municipal Plant.

On Jan. 19 the Winnipeg City Council, ignoring the proposition of the Winnipeg Street Railway Company to sell the municipality its entire railway and lighting plant for $16,000,000, authorized the immediate execution of contracts for the completion of the city power plant, which will ultimately cost $6,000,000. The City Railway Company had offered to reduce the regular rate for light and power 20 per cent below the present schedules and to sell all the power the city might require

for retail purposes at $24.60 per annual horse-power. The city plant will generate 60,000 hp. That the feeling between the Winnipeg Street Railway Company and the municipality is tense is indicated by the refusal of the latter to allow the streets to be opened for carrying out a recent ordinance requiring circuits to be placed underground.

Transformers and Secondary Distribution.

At a meeting of the Lewis Institute branch of the A. I. E. E., held at Lewis Institute, Chicago, on Jan. 20, at which about 425 members and visitors were present, Mr. Harry B. Gear, general inspector of the Commonwealth Edison Company, gave an interesting talk on the topic "Transformers and Secondary Distribution." In the first alternating-current lighting systems, he said, the transformers usually had 50-volt secondaries. On account of the heavy line loss with this low voltage, the transformers had to be located close to the consumer, and for this reason it was customary to hang a transformer near each building, which made a very expensive and inefficient installation. Later came the three-wire, 110-220-volt secondary, which made it possible to supply a number of consumers from one transformer, and by taking advantage of the "diversity factor" it became possible to supply a given district with a very much smaller amount of transformer capacity. In this way a few large transformers take the place of many small ones, and the first cost and installation cost are much reduced, and the efficiency is better.

It does not pay, however, to cover too large a territory from one transformer. In illustrating this the speaker assumed the case of two adjoining city blocks (600 ft.) and worked out a comparison of cost, first with one transformer for both blocks, and, second, with a transformer in each block. In the first case the transformer was cheaper and the copper more expensive than in the second case. The practice of the Commonwealth Edison Company is to locate one transformer in the center of each block, and run a three-wire circuit 300 ft. in each direction. No attempt is made to figure the line losses in such systems. The company makes a practice of putting up certain standard lines, more than large enough to take care of the existing loads, and as the load grows on these lines simply increases the transformer size from time to time.

Three-wire circuits are not used unless more than 40 lights are to be supplied. If any service calls for a larger capacity than 50 kw, two or more transformers are put in parallel to supply it. It is not the rule to operate motors on lighting circuits on account of the disturbing effects of the motor currents. Only motors smaller than ½ hp are put on lighting circuits. For motors larger than ½ hp and up to 15 hp the open delta is used with two transformers. For still larger sizes, three transformers are used.

In the discussion following the lecture, Mr. Gear explained the method of splitting off single-phase lighting feeders from a trunk three-phase four-wire feeder. He showed how four voltmeter compensators are used and how they are set, so that the station voltmeters read the voltages existing at the distant ends of the feeders. He stated that in some recent installations the voltage of each feeder is regulated automatically by means of a contact-making voltmeter.

Effect of Dirt on Globes and Reflectors.

Mr. A. L. Eustice presented a paper before the Chicago section of the Illuminating Engineering Society, Jan. 22, the subject being "Lamp Efficiencies or the Efficiency of the System—Which?" This paper took up the results of some of a large number of tests made by Mr. Eustice on the loss of light due to dirt on globes and reflectors. The results given included one laboratory test on a 60-watt tungsten lamp and clear prismatic bowl reflector; 13 tests on actual installations of Nernst lamps before and after cleaning and two tests on an installation of 4-amp arc lamps.

The test on the tungsten lamp and reflector, which was made after they had been hanging for one year in the Nernst factory laboratory so that a large amount of dirt had collected, showed 35 per cent loss in lower hemispherical candle-power. Cleaning the reflector by wiping and dusting reduced this to 19 per cent. The lamp and reflector were then scrubbed in soap and water. The results of measurements then taken were made the basis for the percentage losses given before.

The five Nernst lamp installations tested showed losses ranging from 1.5 per cent to 20.4 per cent. In some of these cases the loss was partially due to depreciation of the lamp by the falling off in candle-power of the glower and the blackening of the reflecting surface above the glower. The lamps when tested dirty were in ordinary maintenance condition.

The arc-lamp installation showed a loss of 20 per cent, largely because of the dirty condition of the inner globes. In presenting the figures, Mr. Eustice called special attention to the danger of taking laboratory figures as representing commercial conditions of actual installations. He said that the data obtained with prismatic glassware, as has already been quoted, were so astonishing as to lead to a change of plans for the tests which originally contemplated laboratory tests only. He said that these results would be supplemented later by others which he did not have time to tabulate and draw conclusions from. Most of the installations tested and reported were from the older types of Nernst lamp. An installation of Westinghouse Nernst lamps, however, was tested—that in the Siegel-Cooper Company store in Chicago. In this case the watts per lumen (that is, the watts per square foot required to produce 1 ft.-candle average illumination) were 0.240 with clean, new lamps; 0.276 with clean lamps depreciated by use, and 0.295 with glassware dirty and lamps depreciated with use, as under ordinary maintenance conditions. The conditions in this case were that of a general merchandise store with white ceilings, white walls and maple floor. The lamps were of the three-glower type.

Chairman Cravath announced that the membership of the Chicago section had reached 183 at the first of the year, 73 new members having been accepted during the year. The present section officers continue until June, 1909, in order to bring the election of new officers in accordance with a recent amendment to the constitution.

Kalamazoo River Water Power.

The Commonwealth Power Company, of Jackson, Mich., is developing 23,000 hp at five various points of the Kalamazoo River and at one point on the Grand River. The largest power is at Webber, where 6000 hp is generated; 3000 hp is generated at Otsego, and 2000 each at Plainwell and Ceresco. The company has also steam plants at Jackson, Battle Creek and Kalamazoo; the first mentioned is now being practically doubled in size, to have a capacity of 4000 hp, while the two last mentioned each generates 1000 hp. The transmission lines of the company cover a territory of 140 square miles, including Allegan, Otsego, Kalamazoo, Galesburg, Augusta, Battle Creek, Marshall, Albion, Parma, Jackson and Lansing. Grand Ledge is abandoning a municipal plant and has contracted with the company for the operation of its pumping plant and to light its streets. The company supplies 10,227 hp to motors in manufacturing plants.

New Telephone Receiver.

Among the early experimental shapes of telephone receiver was the "spoon" type, in which the permanent magnet was set at right angles to its extension pole piece. However, the hand type, which is the form of receiver in common use to-day, soon superseded all others. On the other hand, the spoon type seems to lend itself well to certain adjustments, as evidenced by a recent patent granted to J. T. Curtis, of Bement, Ill. In the receiver therein described, the U-type magnet carries two pole extensions and a spacer between them; each extension has its own coil. The pole faces of the extension parallel the length of the magnet, which latter is held about midway of its length in the wall of a ball-like casing, the pole-end being within the

ball. A hand piece screws onto the ball so as to cover the projecting end of the magnet. The diaphragm is carried by a formed-up annulus, against which it is held by the ear cap. The seat for the diaphragm is tapered and the clamping face of the cap is cut to match, in a manner such that forcing the cap home puts the diaphragm under radial tension. The annulus screws down on a neck opening from the ball casing, in a manner to confront the pole faces with the diaphragm. A proper adjustment is effected by adjusting the annulus upon the threaded neck, and then a ring lock-nut carried by threads upon the outside of the annulus serves to jam the parts, thereby locking them in position.

CURRENT NEWS AND NOTES.

WATER-POWER CONTROL IN OKLAHOMA.—A bill will be introduced in the Oklahoma Legislature for State control of streams having water powers.

ILLINOIS WATER POWERS.—Governor Deneen, of Illinois, in his inaugural message discusses at length the subject of water powers, and recommended action whereby the State should invest itself with title to such powers now undeveloped.

MUNICIPAL OWNERSHIP IN WASHINGTON, D. C.—A bill has been introduced in Congress authorizing the Commissioners of the District of Columbia to acquire all the present electric lighting and gas-light plants for operation by the District government.

PHILADELPHIA PLAN TO TAX PUBLIC UTILITY POWER PLANTS.—A bill has been introduced in the Pennsylvania Legislature to tax the power plants of public utility companies in Philadelphia, which under present law are exempt from taxation. The assessed value of these plants in the city is $1,933,600.

WORCESTER POLYTECHNIC A. I. E. E. BRANCH.—The next meeting of the Worcester Polytechnic Institute branch of the A. I. E. E. will be held in the Electrical Engineering Building of the Institute at 8 p. m. Friday, Jan. 29. Mr. Leon I. Thomas will deliver a lecture on "Wireless Telephony and Its Recent Developments."

N. E. L. A. CONVENTION.—It has been decided to hold the annual convention of the National Electric Light Association during the first week in June at Atlantic City, and President Eglin has made the necessary arrangements with the hotel managers' association for that period, including the use of the Pier, where the meetings will be held and the exhibit made.

MASSACHUSETTS MUNICIPAL PLANT LEGISLATION.—A bill has been introduced into the Massachusetts Legislature to authorize cities and towns having gas or electric lighting plants to purchase gas or electricity from an adjoining city or town, or from any corporation manufacturing it. Another bill authorizes the town of South Framingham to purchase electricity for municipal purposes for use in its water supply and sewage disposal departments.

NIAGARA POWER.—According to a report just issued, the shutting down of the two American Niagara water-power plants on several occasions last year showed that these plants in diverting 8000 cu. ft. of water per second lowered the water level on the American side only 2/5 in., the normal flow level of the American Falls being about 19 in. On the other hand, the level of the river at Grass Island was lowered 3¼ in., and near the Ontario intake on the Canadian side about 1¼ in.

I. E. S., BOSTON BRANCH.—The annual meeting of the Boston section of the Illuminating Engineering Society was held at the Edison Building, Boston, on the evening of Jan. 19. The following officers were elected for the ensuing year: Chairman, Mr. Theo. H. Piser, Welsbach Company, Boston; secretary, L. D. Gibbs, Edison Electric Illuminating Company, Boston. The paper on "Street Lighting" presented at the New York section by Mr. Walter C. Allen, electrical engineer of the District of Columbia, was read.

ELECTRICAL TRADES SOCIETY.—At the January meeting of the board of directors of the Electrical Trades Society, of New York, the Wire & Telephone Company, of Rome, N. Y., was admitted as a new member. A membership committee was named with Mr. John H. Dale, president of the Dale Company, New York City, as chairman. Every manufacturer and every dealer in electrical supplies is eligible to membership in this society and an active campaign for new members is to be inaugurated. The headquarters of the organization is at 80 Wall Street.

MUSEUM OF SAFETY AND SANITATION.—Announcement has just been made of the acceptance of the treasurership of the Museum of Safety and Sanitation by Mr. Frank A. Vanderlip. An executive office for the administrative and promotive work of the museum has been opened at the United Engineering Societies Building, 29 West Thirty-ninth Street, New York City. Plans are being pushed forward along practicable lines to prevent the loss of life and limb through the Museum of Safety and Sanitation, where safety devices for dangerous machines and preventable methods of combating dread diseases, may be demonstrated.

WIRELESS AND WRECK OF THE REPUBLIC.—Wireless telegraphy scored a triumph at the wreck last week of the White Star liner *Republic,* which was rammed and sunk off Nantucket. Immediately following the disaster the wireless operator on the vessel signaled the news and immediately almost a dozen vessels equipped with wireless which were within signaling distance, including several ocean liners, left their courses and speeded to the scene of the wreck, which was indicated in the message intercepted. With the assistance thus afforded, all hands—numbering almost 2000—were safely transferred from the sinking vessel, some of the aiding vessels playing their searchlights on the boats going to and from the vessel.

CANADIAN PACIFIC ELECTRIFICATION.—It is announced that the Canadian Pacific Railway has decided to electrify its system through the mountains of the West. Plans were begun a year ago, when experts were sent to examine the mountain streams and the available water supply between the eastern Rockies and the Pacific Coast range. They reported that there were enough waterfalls immediately adjacent to the Canadian Pacific's main line to "develop energy sufficient to run all the railways in the world." Many water sites have been purchased and throughout British Columbia options on others have been obtained. The advances made by the Canadian Northern and the Grand Trunk lines in the West are said to have been responsible for this action by the Canadian Pacific.

THE ELECTRIC PIANO PLAYER.—At a meeting of the New York Electrical Society, held in the Engineering Societies Building, New York, on Jan. 20, Dr. John F. Kelly, president of the Telelectric Company, delivered an interesting and instructive lecture on "The Development of the Electric Piano Player." After reviewing historically the inventions relating to automatic piano players Dr. Kelly outlined the problem of producing the required electromagnetic devices for the so-called electric player and explained the schemes used for controlling the speed, touch, expression and accentuation. As now constructed the electric piano player affords control of the individual notes to such an extent that the melody is properly accentuated in distinction to the accompaniment, while the time is under perfect control, and the harmony is mathematically exact. That the electric player has reached a high state of development was demonstrated by means of machines in actual operation in piano solo work and in accompanying the human voice both while under manual control and while performing automatically.

OXFORD ELECTRICAL LABORATORY.—Work has commenced on the laboratory given to the University of Oxford for electrical work by the Drapers' Company of London.

FORT WAYNE ELECTROTECHNIC CLUB.—The Electrotechnic Club, of Fort Wayne, Ind., held its annual social meeting on Jan. 19. The attendance was large and the entertainment and social function were heartily enjoyed.

SIXTY-CENT GAS FOR EVANSVILLE, IND.—A bill has been introduced in the Senate by Senator Durre providing for 60-cent gas in Evansville. At present the rate charged by the Evansville Gas & Electric Light Company is $1.10 per 1000 ft. for gas for fuel and light.

WIRELESS BETWEEN COLLEGES.—Princeton and Columbia Universities and the University of Pennsylvania have students' wireless clubs, which propose to establish regular wireless communication between New York and Princeton and Princeton and Philadelphia.

BROOKLYN ELECTRIC LIGHTING RATES.—A bill has been introduced in the New York State Legislature reducing the maximum rate in Brooklyn, N. Y., for electrical energy from 12 cents per kw-hour to 10 cents. The change would make the rate uniform with that of Manhattan Borough.

ELECTRIC HEADLIGHTS.—Senator Kistler has presented a bill to the Indiana Senate which, if it becomes a law, will require electric headlights on all locomotives operated by railroads in Indiana. The bill provides that the light shall be of not less than 2000 cp. The railroads are given until Sept. 1, 1909, to equip all passenger engines, and Jan. 1, 1910, for freight engines.

GRAND RAPIDS-MUSKEGON WATER-POWER FRANCHISE.—The supervisors of Mecosta County, Michigan, contend that a franchise for the use of water power on the Muskegon River granted to the Grand Rapids-Muskegon Power Company will expire April 1, because of non-compliance with its provisions. It is stated that the Muskegon River is capable of developing 26,000 hp within the county. One proposition is to require a payment of 7 per cent of the gross earnings arising from the use of the power developed on the river.

INDIANA PUBLIC SERVICE BILLS.—Senator Beal and Representative Garrard will each introduce a public utilities bill before the Indiana Legislature. Each bill provides for a State commission of carefully selected men to have charge of public utilities questions in cities of Indiana, much as the Indiana Railroad Commission now has control over questions relating to railway rates, safety measures and other railroad questions. The Indiana gas men are said to be in favor of an equitable public utilities law because of the belief that such a law would make more secure the standing of reputable companies in the stock and bond market and would place such companies out of the realm of interference by politicians.

EFFICACY OF TROLLEY WIRES.—In a paper presented before the Division of Industrial Chemists and Chemical Engineers of the American Chemical Society on Dec. 31, 1908, Mr. F. Woods called attention to the desirability of purchasing trolley wire with restrictions on the quality of material. He showed that two wires having equal diameter and equal conductivity may differ greatly as to torsional and tensile strength. Wires should possess high tensile strength in order to withstand abnormal loads, while high torsional strength indicates homogeniety and toughness—two desirable characteristics. In order to obtain the best results it is necessary to use high-grade copper, and to prevent an excess of cuprous oxide entering at any stage of the manufacture.

MICHIGAN WATER-POWER INVESTIGATION.—The Michigan Legislature has appointed a special waterways committee with a view to investigating charges made that the waterways of the State are now being acquired by large corporations without adequate compensation, and for purposes which threaten the commercial development of the State. The cause of the investigation has been the publication of charges that the Grand Rapids-Muskegon, Commonwealth and West Michigan companies on the western side of the State, and the Detroit Edison Company on the eastern slope, had formed a merger for the purpose of gaining absolute control of all water-power flowage rights, and that the Edison Company had purchased practically all the rights on the power-producing streams of eastern Michigan, all of which power that company could not use for 50 years.

ELECTRIC RAILWAY ELECTROLYSIS IN NEW BEDFORD, MASS.—Mr. William E. Foss, consulting engineer, of Boston, has made a report to the city of New Bedford, Mass., giving the results of investigations as to electrolytic corrosion in that city from electric railway ground returns. It would be necessary, he said, for the electric railway company to insulate its return circuit completely to stop all electrolytic corrosion, but the amount of damage which has been discovered does not seem to warrant the outlay, provided a satisfactory arrangement can be made between the interested parties covering the expense for damages that are discovered and for carrying out means for reducing electrolytic corrosion to a minimum. He recommended all defective rail bonding to be repaired, the installation of test wires and boxes, the separation of submarine pipes and cables under drawbridges as far as possible, and the reduction of present excessive fall of potential on non-insulated railway return conductors.

TELEPHONE COUPON BOOKS.—Mr. J. B. Hoge, of Cleveland, Ohio, the well-known independent telephone manager, has designed an interchangeable coupon book for the use of the long-distance telephone companies of the country, patterned to some extent after the books used by the electric railways which are members of the Central Electric Railway Mileage Bureau. The coupons are for five cents each, and as many may be taken out as are required to pay for a message at the office of any of the companies that enter into the arrangements. A clearing office will be established at Cleveland, and all coupons will be sent there, where settlements with the companies will be made. It is understood that all the independent long-distance companies will become members of this bureau. In fact, many of them have been working for some time to secure a uniform plan of some kind along these lines. The books will insure a reduction in the rates, because of the fact that the purchaser pays in advance for many calls. The companies can thus afford to do this.

OHIO TELEPHONIC LEGISLATION.—Representative A. B. Canfield has introduced a bill in the Ohio House of Representatives having for its purpose to compel the interchange of long-distance business between the Bell companies and the independents wherever it is necessary to do so in order to get a message through to destination. It provides for forfeiture of the charter of any company that refuses to connect its lines with those of any other company whenever it is necessary to transmit a message in that way. In the past efforts have been made to secure such a law, but not enough members could see the necessity of putting requirements upon the companies that might destroy competition and make it impossible for the further development of territory by the independents. This bill also contains a provision limiting the rate that local exchanges shall charge to $24 a year in cities of 100,000 population or less, with an increase of $6 for each 100,000. For long-distance business the rate is to be not more than half a cent a mile for five minutes' conversation. The difference in the length of conversation is the greatest change over present rates for long-distance service.

Large Water-Power Stations of the Rochester Railway & Light Company.

THE largest and most important water-power station of the Rochester Railway & Light Company is known as Station No. 5. It is located on the Lower Falls of the Genesee River, where there is a head of 96 ft. and where there is at present being developed about 4550 kw. An excellent view of the station and of the falls at slack-water period is shown in Fig. 1. A plan view and sectional elevation of the complete generating station is shown in Fig. 2, and Fig. 4 gives a view of the power-house interior. The lower level of the river is about 124 ft. below the general level at the top of the high bank, so that the upper level of the river is more than midway between the street level and the base of the falls.

Station No. 5 is on the opposite bank of the river from Station No. 15, described in our issue of Jan. 14, and is not much more than a stone's throw below it. The power house, which is

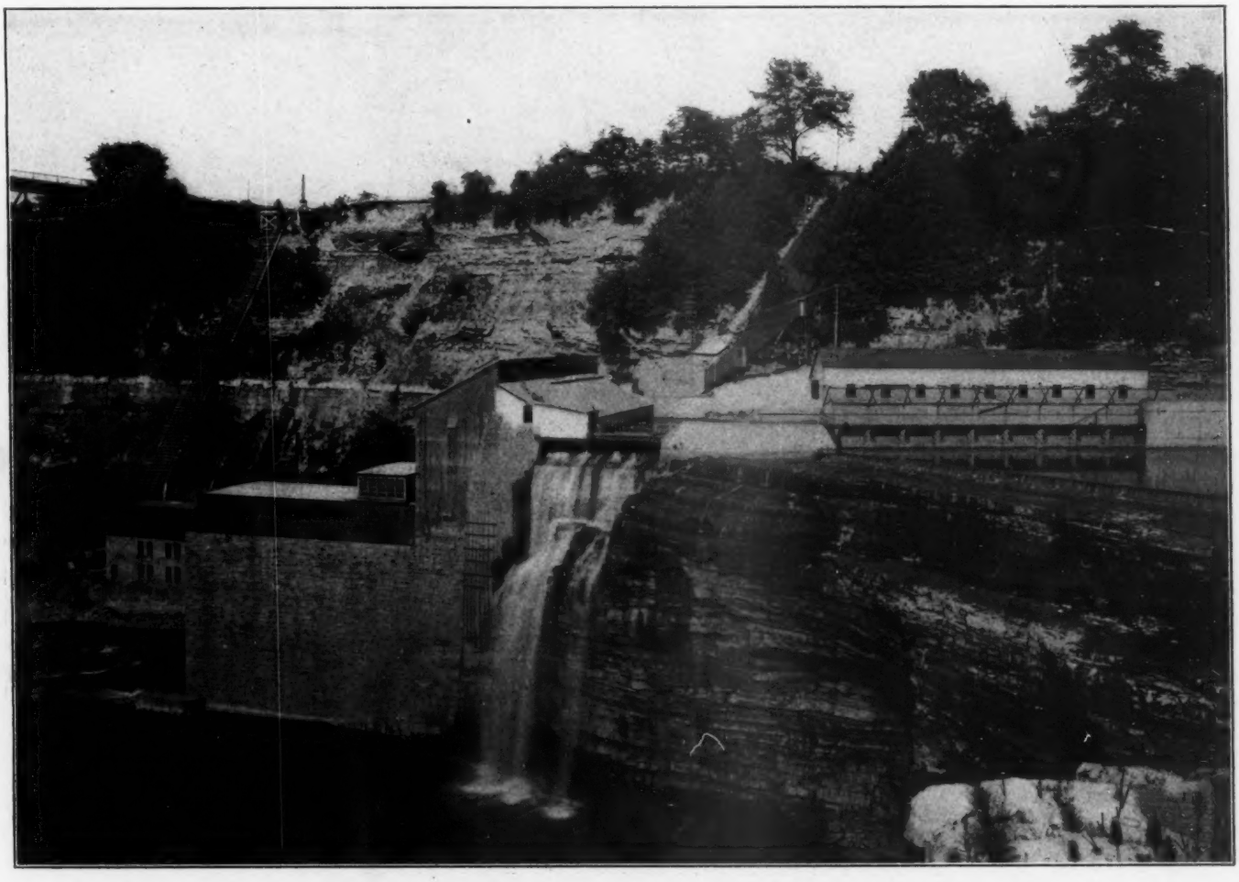


FIG. 1.—VIEW OF STATION NO. 5 OF THE ROCHESTER RAILWAY & LIGHT COMPANY ON THE LOWER FALLS OF THE GENESEE RIVER.

47 ft. x 90 ft. x 47 ft. high, is built of masonry on concrete foundations placed in the rock at the river bottom. The construction and layout are such that the station can be extended eastward toward the high bank of the river, and its present proportions duplicated. At the outset the escarpment was faced with concrete and the forebay used for an old plant located at this point enlarged to give a rock length of 80 ft. To the westward or river edge the depth of water at the intake is 17 ft.

From the forebay two 11-ft. and three 6-ft. penstocks are run, as shown in Fig. 2. Only one of the 11-ft. penstocks is in use. The penstocks have a vertical descent to the floor of the station. The large penstock has a height of 94½ ft. and extends under the floor of the turbine room a distance of 75 ft. It is made of ⅝-in. steel, and to it are connected three 2100-hp turbines; two built by the Trump Manufacturing Company and one by the I. P. Morris Company. To the smaller penstocks are connected, respectively, a 900-hp Morris turbine, a 450-hp Leffel turbine driving a railway generator, and another of the same size and make driving an alternator. The large waterwheels are 42 in. in diameter with 96-in. openings from the penstock. The tail race is 14 ft. deep and has a concrete floor. The 11-ft. penstock is fitted with a Sturgess relief valve and the 6-ft. penstocks are equipped with Lombard relief valves. Each of the 2100-hp turbines has an 84-in. valve for shutting off the water in case of repairs, and the penstock supplying the 900-hp turbine is fitted with a hydraulic valve for this purpose, the other valves being motor-operated. All the turbines are equipped with Sturgess oil-pressure governors so interconnected that in case of failure of the pump on one unit, the pressure can be supplied by the rest. A 25-ton crane spans the generator room so that repairs can be readily made. An inclined railway runs from the cliff overhead to the power house below, as shown on the left of Fig. 1, and on this inclined railway all supplies, etc., are brought to the station.

The head-gate house is built at an angle to the flow of the river so that the swift exterior surface flow sweeping the full length of the gate-house screens carries all refuse and floating cake-ice over the falls beyond. The forebay is thus kept free of refuse and cake-ice, so that in winter mush-ice, also known as anchor ice, frazil or slush ice, is all that has to be contended with at the racks leading to the penstocks. Extending over the racks and gates leading to the penstocks is a corrugated iron shed which also hangs over a portion of the spillway. The front of the shed is brought down close to the water so that in winter the men who rake the slush-ice from the racks are well protected from the weather. Back of the racks and communicating with the spillway is an ample ice run. These simple provisions, combined with the strategic position of the power plant, have left it comparatively free from serious ice troubles.

The electrical equipment installed comprises three 1200-kw, three-phase, 4150-volt General Electric generators, each of

which is direct-connected to one of the 2100-hp turbines; one 500-kw, 550-volt generator, one 300-kw, 550-volt generator, and one 350-kw, 4150-volt, three-phase generator; the last three machines being of General Electric, Westinghouse and Bullock make, respectively. In addition to the generating equipment there is the following transforming apparatus: nine 71-kw constant-current transformers for alternating-current series circuits and a 500-kw frequency changer. The latter set has a 4150-volt, three-phase, 60-cycle motor and a 11,000-volt, three-phase, 25-cycle generator and is used for supplying energy to a 40-mile suburban line formerly fed from a steam-driven station located about six miles outside the city. Each of the large alternators receives exciting current from a 20-kw multipolar generator fitted to the extreme end of the shaft. The frequency changer has a 25-kw exciter set belted to it as has also the Bullock set. In addition there is a 50-kw motor-generator set available for boosting railway feeders.

The switchboard is situated on a gallery or pulpit on the falls side of the power house. The equipment is for a four-wire, three-phase system. As shown in Fig. 4, there are three galleries. On the first gallery the general arrangement consists of three generator panels in the center of the board with two interlocking oil switches and duplicate busbars. To the left are tie-feeder panels with oil switches and time-limit relays and farther on are three-phase distributing panels, arc-feeder panels and at the end a tie-line panel for an incoming circuit from Station No. 15. To the right of the generator panels are the panels for the frequency changer, the panels for the smaller alternator, exciter panels and panels for starting the frequency changer. On the left beyond the tie-line panel are panels for two incoming and two outgoing feeders for controlling energy received from Niagara Falls from this point. Beyond these panels are the panels for controlling the railway generators and feeders.

The second gallery contains the line disconnecting switches with static and lightning arresters mounted in brick compartments. The feeders pass from the panels on the first gallery to switches on the second gallery and thence out through the roof of the station into ducts built in the wall overhead. On the top gallery are the constant-current transformers for the series arc-lamp circuits. Each transformer has its own panel mounted in front of it and the lightning arresters are placed on the wall back of the transformers. In all of the stations having such apparatus no attempt is made to have a board for transferring circuits, each transformer being equipped with a separate panel.

Two high-tension lines carrying energy from Niagara Falls are brought underground to Station No. 5. One of these passes direct from Station No. 6 and the other also comes from Station No. 6, but reaches Station No. 5 by way of Station No. 1. The 11,000-volt lines radiate from Station No. 5, one line being used to supply energy to Sodus Point, 40 miles away, and the other supplying energy to the railway at Charlotte and vicinity. The Niagara lines are run underground from the Rochester Railway & Light Company's transformer station at Elmwood Avenue to Station No. 6. The transformer station is supplied from the Ontario Power Company's switching station, four miles outside the city. All the feed wires from Station No. 5 are carried up the face of the power house next to the falls, where they enter conduits forming part of the race wall and are carried up the high bank, where they enter the underground conduit system.

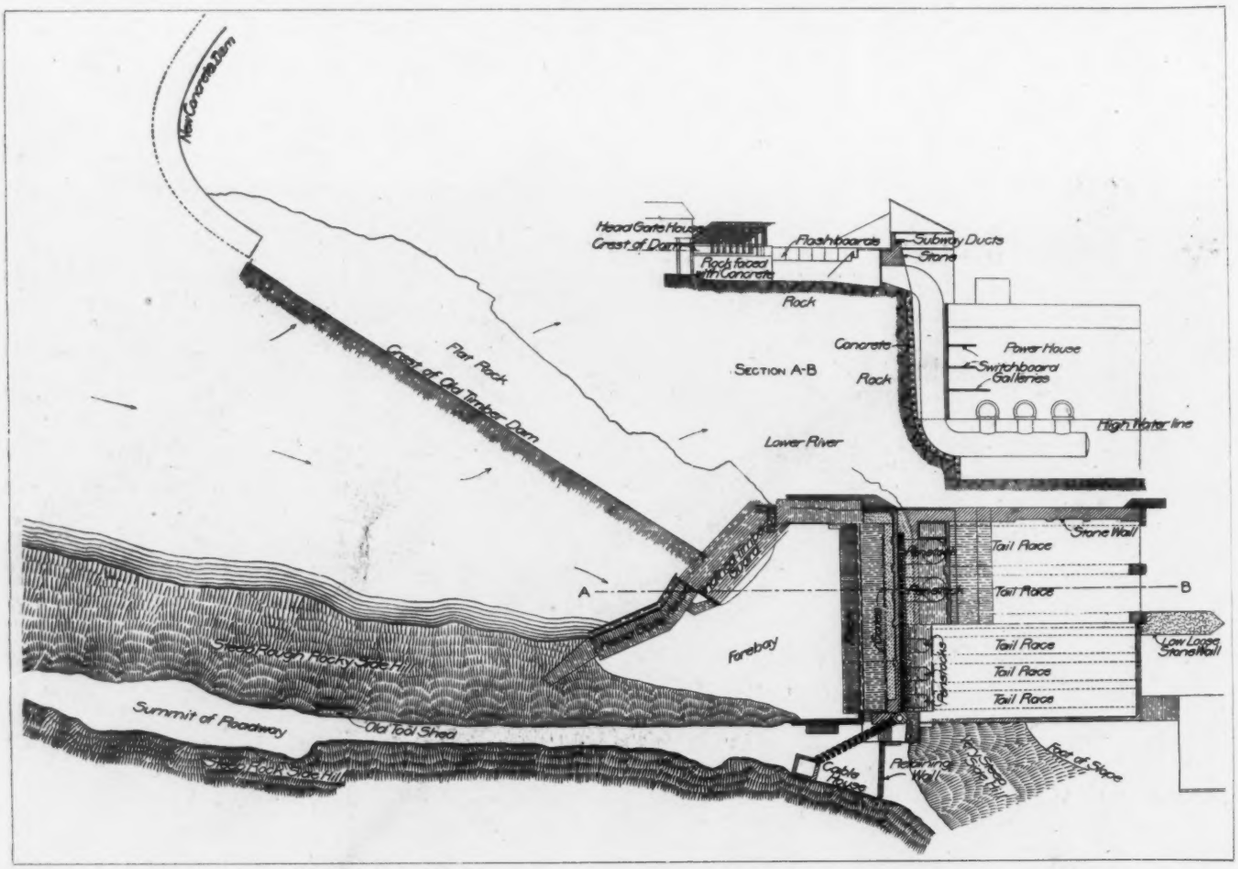


FIG. 2.—PLAN AND SECTIONAL ELEVATION OF WATER-POWER DEVELOPMENT.

STATION NO. 4.

Station No. 4 is on the Upper Falls on the west side of the Genesee River alongside the tracks of the New York Central Railroad. The station is reached from the intersection of Central Avenue and North Water Street and is shown in Fig. 3. In the valley across the river is also shown Station No. 2, which is a combined steam- and water-power plant, the water

being taken from Brown's Race. Station No. 4 has many features of interest, chief among which are the number of old Edison machines in use and the switchboard for lighting circuits

FIG. 3.—GENERAL VIEW OF UPPER FALLS SHOWING STATIONS NO. 4 AND NO. 2.

recently installed. When water is plentiful this station carries a railway load of about 3000 kw.

The head available at Station No. 4 is 94 ft., and the water power developed is 4200 kw. The equipment comprises two

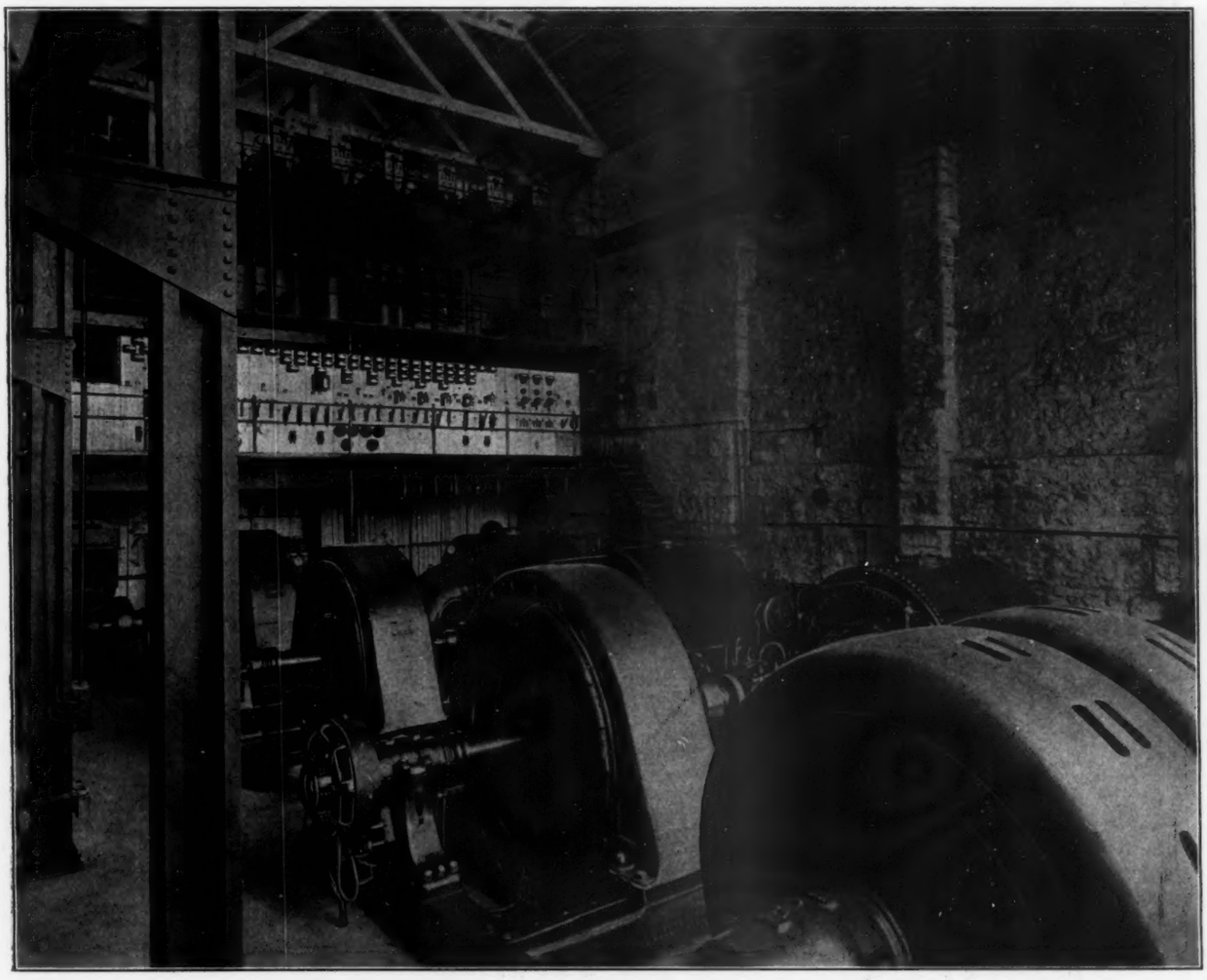


FIG. 4.—INTERIOR OF STATION NO. 5 OF THE ROCHESTER RAILWAY & LIGHT COMPANY.

twin Leffel turbines rated at 500 hp and belted to four 150-kw, 250-volt Edison bipolar machines; two single Leffel wheels rated at 500 hp, belted to four 150-kw, 250-volt Edison machines; one Poole & Hunt wheel rated at 600 hp, connected by the American system of rope drive to a countershaft, to which are belted two 150-kw, 125-volt Edison machines; one Poole & Hunt wheel belted direct to two 150-kw, 125-volt Edison machines; one 500-hp Leffel turbine belted to two 150-kw, 125-volt Edison machines; one 1200-hp Trump wheel belted to countershaft to which are belted two 150-kw and two 200-kw Edison bipolar machines; one 1200-hp Trump wheel direct-connected to a 800-kw, 250-volt generator feeding the outside wires of the Edison system; and one 1200-hp Allis-Chalmers wheel direct-connected to a 800-kw, 250-volt generator, also feeding into the outside wires of the Edison system. The 250-

volt Edison generators are, as occasion demands, thrown in series and connected to the street railway network. In order to take advantage of the copper distribution available from this station two 500-kw motor-generator sets and one 350-kw motor-generator set are installed. These receive energy from the steam-driven stations and feed into the network focused here.

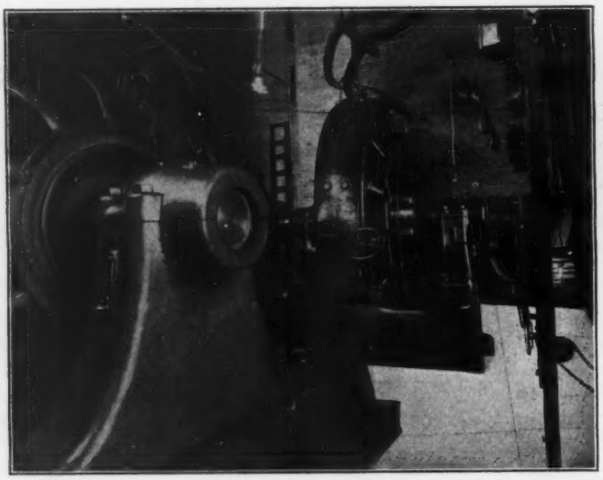


FIG. 5.—DIRECT-CONNECTED GENERATORS IN STATION NO. 4.

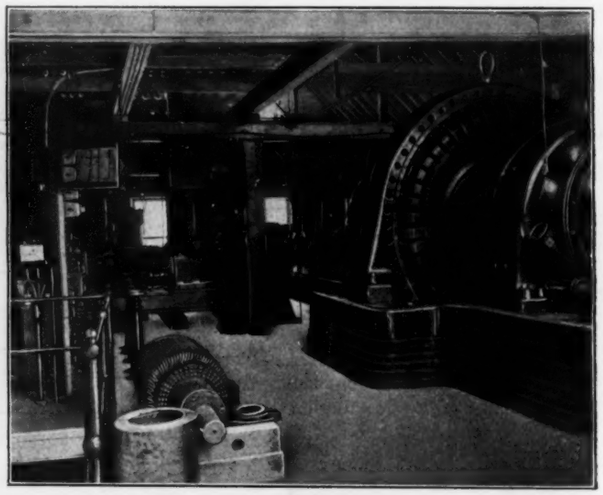


FIG. 6.—UPPER FLOOR OF STATION NO. 4.

In this way a great saving is effected in the amount of copper necessary to feed this district from the other stations at periods of very low water. The 300-kw motor-generator set is made up of a 350-kw induction motor and two 150-kw, 125-volt compound-wound generators. In the summer it is used principally as a 125-volt or 250-volt booster for the railway feeders and during the fall and winter it is used chiefly as a plain shunt-wound machine feeding into the Edison system. The machines are capable of taking full load without the series winding. The other motor-generator sets have synchronous motors.

As might be inferred from the exterior view, the station is well crowded with generating apparatus. The vertical drives are 80 ft. high from center to center, and there is just enough room in the bottom of the station building for the direct-connected sets. The latter are shown in Fig. 5, and a view of the upper floor is given in Fig. 6. The Edison machines are a sort of survival of the fittest. They withstand rough usage better than later machines, and their momentary overload capacity is enormous. The Rochester company purchased them when the fever for direct-connected sets started, at about $8 per kilowatt, so that the actual investment is small. A number of them are also installed in other stations, and for peak-load conditions it is doubtful if cheaper and more reliable apparatus can be had. The machines are used chiefly for overloads on water power, and when water is plentiful they carry the load of the steam units, which may then be shut down. When the water is low the company has sufficient other more economical units to carry the load; but since at high water and flood conditions the water runs to waste anyway, the Edison machines are brought into use. For peak-load conditions the machines are used about 70 hours a year.

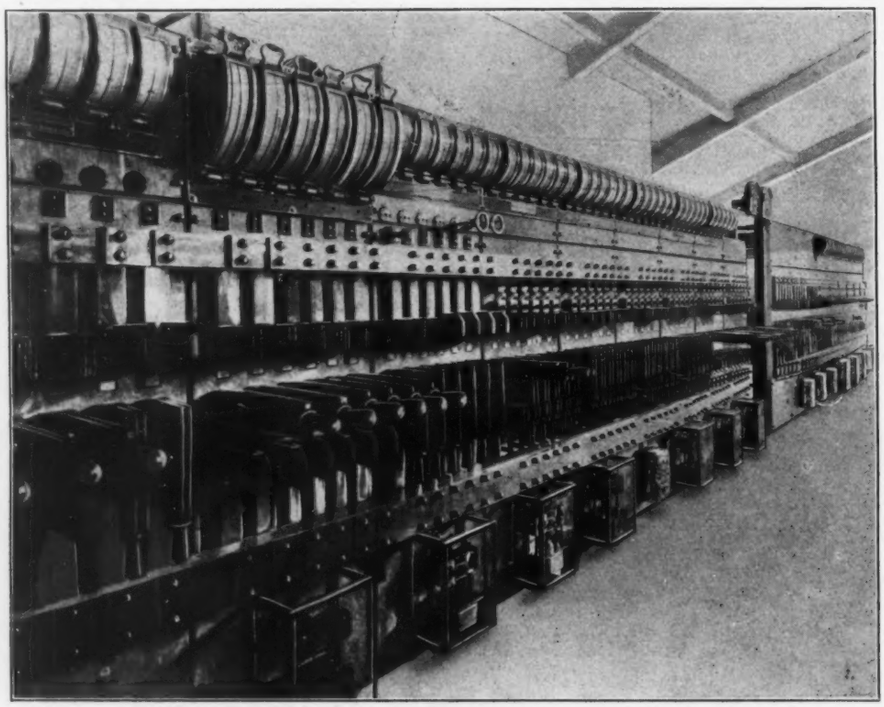


FIG. 7.—FRONT OF SWITCHBOARD FOR LIGHTING CIRCUITS IN STATION NO. 4.

The switchboard for the lighting circuits in Station No. 4 is shown in Fig. 7. This board controls Edison three-wire circuits with a total capacity of 60,000 amp in generators and 75,000 amp in feeders at 125 volts. The board controls 16 generators and 30 two-wire feeders. The generator panels are equipped with watt-hour meters and the feeder panels have double-throw switches with fusible cut-outs and ammeters. The board is arranged for carrying two pressures on any portion of the feeder and generator panels. Each generator and each feeder panel occupies a space 4½ in. wide, which is very small, indeed, considering the circuits controlled. The busbars are carried on the front of the board and the generator panels are equipped with edgewise ammeters at the top, below which are receptacles for voltmeters for balancing and cutting generators in on the system. In the same vertical plane are the rheostat

handle and switch so that the operator has the whole cycle of operations so arranged that mistakes liable to occur are reduced to a minimum. All positive and all negative polarities are grouped together, the neutral panel standing by itself. This enables any repair work or extensions to be made with the board alive and with absolutely no liability of short-circuit. The generator leads are brought to the board from below and the feeders pass out overhead to a room in the back of the board, whence they continue out in conduit to the underground system. The railway circuits are controlled from a board on

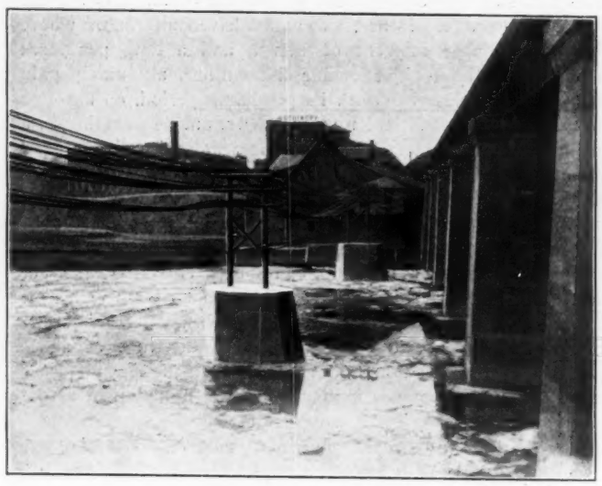


FIG. 8.—POLE LINE CROSSING RIVER.

the river side of the station. The latter board has 12 feeder panels and seven tie panels. There are four tie circuits running to Station No. 6 and three tie circuits running to Station No. 3. Some of the Edison three-wire circuits and the railway circuits are carried on a pole line across the river, as shown in Fig. 8. The lines are supported on cross-arms, which in turn are held by I-beams fastened to concrete piers built on the river bed. The feeders are made up of 500,000 circ.-mil cables.

Fluctuations in the Speed of the Rotors of Alternators Operating in Parallel.

BY GEORGE H. SHEPARD.

In designing an engine for use with alternators, the designer usually draws a curve of crank-effort, of which Fig. 1 is an example from a two-stroke-cycle double-acting engine, and from it calculates the necessary moment of inertia of the flywheel to limit the angular velocity of the rotating parts within certain desired extremes. He then constructs the familiar curve of displacement to show the maximum amount that two similar

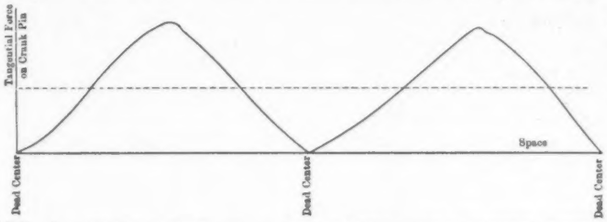


FIG. 1.—CRANK-EFFORT OF A TWO-STROKE CYCLE DOUBLE-ACTING ENGINE.

engine-driven alternators can get out of step under the action of the crank efforts alone, the counter torque being assumed to be uniform. If this amount is less than that allowed by the specification of the electrical manufacturer, it is supposed that satisfactory parallel operation will be obtained; it is sometimes found, however, that excessive pumping of the alternators will take place in spite of such precautions.

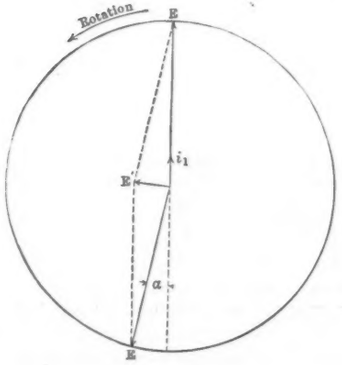
The pumping is due to the fact that the counter torque is not uniform because, in addition to the crank efforts, the rotating parts of the engine-alternators are acted on by the electric cross-current, which exists whenever the machines in parallel get out of step.

Two alternators connected in parallel act as a unit on the external circuit, but oppose one another on the internal circuit, so long as they are exactly in step.

When one of the alternators lags behind the other in step its e.m.f. E (see Fig. 2) changes from a time-phase position in direct opposition to that of the other machine, to some later position. Immediately there is a resultant e.m.f., E', which produces a current i, which, in armatures as usually constructed, lags nearly 90 time-degrees behind E' and thus comes very nearly into time-phase agreement with the e.m.f. of the leading machine and time-phase opposition to that of the lagging machine. The current i is, therefore, a generator current for the leading machine and a motor current for the lagging machine. It evidently involves the taking of power from the leading machine and giving of it to the lagging machine, thus tending to slow the leader and speed the laggard.

The purpose of the present article is to explain the means that may be employed for stopping the enlargement of the angle of phase displacement (α in Fig. 2), while it is still very small.

Since, in good practice, a phase displacement of five or six electrical degrees is the maximum, α may be treated as a very



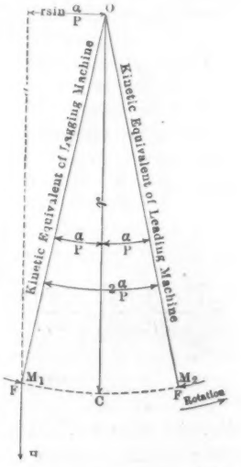


FIG. 2.—VOLTAGE RELATIONS. FIG. 3.—PENDULUM ACTION OF PARALLELED ALTERNATORS.

small angle. Hence, $E' = E \sin \alpha$ as a very close approximation. If i' is the short-circuit current at normal e.m.f. E, the cross-current i has the value $i = i'E \sin \alpha \div E$. The synchronizing power expressed in watts will be $Ei = Ei' \sin \alpha$; expressed in horse-power it will have a value of $Ei' \sin \alpha \div 746$.

Let r be the radius of gyration about the axis of the shaft, of the rotating parts of the machine, in feet, and let F be the synchronizing force in pounds acting at this radius. Then the synchronizing horse-power will be $2\pi rF S \div 33{,}000$, where S is the rotative speed in r.p.m. Hence, one may write,

$$Fr = \frac{33{,}000\, Ei' \sin \alpha}{746\, S\, 2\pi} = K \sin \alpha \qquad (1)$$

where K is a constant having the value indicated.

Let β be the angular displacement of the lagging machine from any fixed axial plane, expressed in mechanical degrees. Then,

$$\frac{d^2\beta}{dt^2} = \frac{Fr}{M_1 r^2} = \frac{K \sin \alpha}{M_1 r^2} \qquad (2)$$

where M_1 is the moment of inertia about the axis of the shaft of the rotating member of the lagging machine.

With the exception of the quantity $\sin \alpha$ the right-hand side

of equation (2) contains only quantities that are dependent on the lagging machine alone; that is to say, the angular acceleration of the lagging machine under any phase displacement is independent of the other machines with which it is in parallel, the other machines being, of course, of the same frequency and terminal e.m.f. The lagging machine may, therefore, be considered as running in parallel with an identical machine, with which its angle of phase displacement is α.

In order to determine the period of fluctuation of the rotating parts of the machine, due to the cross-current, consider the crank effort as absolutely uniform, so that the machine fluctuates from the effect of the cross-current alone.

Suppose that the two machines have suffered a phase displacement α. Since the leading machine experiences always the same synchronizing force as the other, but in the opposite direction, its acceleration is always equal to that of the other, but opposite in direction. The two rotors, therefore, are always swinging either toward or away from each other, with equal, but opposite, relative angular movements. They, therefore, swing equally about their relative mid-position; that is to say, a wheel running uniformly at the mean speed would always be half way between them.

ALTERNATORS IN PARALLEL.

The angular acceleration of the lagging wheel with reference to a fixed axial plane is the same in amount as its angular acceleration with reference to a wheel running uniformly at the mean velocity.

In an alternator having P poles, the angular acceleration of the lagging rotor with reference to a rotor running uniformly at the mean velocity, both being considered as if they were rotating about the same axis, is $\frac{d^2\left(\frac{\alpha}{P}\right)}{dt^2}$. (See Fig. 3.)

But

$$\frac{d^2\left(\frac{\alpha}{P}\right)}{dt^2} = \frac{d^2\beta}{dt^2}$$

$$\therefore = \frac{d^2(\alpha \div P)}{dt^2} = \frac{K \sin \alpha}{M_1 r^2}$$

$$= \frac{PK \sin (\alpha \div P)}{M_1 r^2} \text{ (approximately)} \qquad (3)$$

For the moment $PK \sin (\alpha \div P)$ there may be substituted an equal moment $Hr \sin (\alpha \div P)$, (see Fig. 3), where $H = PK \div r$. The force H is constant and acts always parallel to the kinetic equivalent (OC of Fig. 3) of the wheel running uniformly at the mean velocity.

It is evident, therefore, that the rotating parts of an engine-driven alternator, as far as their oscillation about their mean position under the cross-current alone is concerned, are the kinetic equivalent of a simple pendulum suspended at O, the axis of the shaft, and swinging on either side of the vertical line OC, but having the force of gravity replaced by the force

$$PK \div r$$

The period of oscillation of the rotating parts from M_1 to M_2, Fig. 3—that is, from farthest behind to farthest ahead is, then,

$$T = \pi \sqrt{\frac{M_1 r^2}{PK}} \qquad (4)$$

Another fact shown by this analogy is that the cross-current will not bring the rotating parts up to the mean position and stop them there; but, neglecting friction, will swing them to a relative displacement ahead as great as they formerly had behind. Therefore, if an alternator operating in parallel with other machines suffers a phase displacement, the cross-current will tend to keep it continually surging back and forth through that phase displacement.

If the natural period of oscillation of the rotor pendulum under the cross-current is such that during alternate pendulum periods it may regularly receive from the engine greater energy than the rotor gives up, and during intermediate periods may regularly give up greater energy than the rotor receives, then enlargement of the oscillations will occur, the limit being set by the frictional resistances.

If the amount of energy periodically gained and lost by the rotor in synchronism with its pendulum period is small enough in comparison to the total energy transmitted from the engine to the generator during the same period, the frictional resistances will stop the enlargement before the oscillations become objectionably large. Hence, an engine-driven alternator whose rotor has a large moment of inertia and a long pendulum period can, without objectionable fluctuations, alternately gain and lose, in synchronism with its pendulum period, an absolute amount of energy sufficient to cause objectionable pumping in a machine having a rotor of smaller moment of inertia.

The above considerations are of special importance in connection with gas engines on account of the irregularity of their crank efforts. In them combinations of cylinders and cranks equivalent to one two-stroke-cycle, double-acting cylinder are common for driving alternators. In such a case it is apparent that during a regularly recurring period about equal to the time of one half stroke, there will be a time when the crank effort exceeds the mean counter-torque, and another time of about equal length when the crank effort is less than the mean counter torque. For such engines it may, therefore be assumed at the outset that the value of T, as calculated from equation (4), should not approximate the time of a quarter revolution. A value of the moment of inertia may be calculated on this assumption, as well as on the common one of limiting the fluctuations of speed.

It is desirable to construct the flywheel of the engine-drive alternator, so that its rotating parts will have, about the axis of the shaft, the larger of the two moments of inertia thus found; and its suitability should be further tested by constructing the displacement curve.

The effort will usually be made to increase T of equation (4) above the period of fluctuation of the crank effort, in order to decrease the displacements of the rotor of the alternator from its mean position, under the action of the varying crank efforts, and to keep the variations of speed within small limits. However, this method may lead to a flywheel impracticably large. In such a case resonance may be avoided by making T small, and the fluctuations may be dampened by a short-circuited winding on the rotor of the alternator.

It may easily happen that there will be sufficient lag in the energy-regulating mechanism, so that the governor will increase the delivery of energy to the engine during the periods of large crank effort, and diminish it during the periods of small crank effort, thus increasing the fluctuations. To avoid this action, the governor should be as little affected as possible by fluctuations of speed within the revolution, but it should respond to changes of the mean speed.

Practical success in this respect is facilitated by the fact that considerable change of speed from full-load to no-load may be allowed. In driving induction motors, a drop of 12.5 per cent from no-load to full-load may be allowed in the voltage at the busbars in the station. Under such conditions the speed of the engine may be allowed to decrease 3 or 4 per cent. Under lighting load the voltage should be kept more nearly constant, but the station attendant can handle a much larger gradual change of the engine speed by means of the field rheostats.

With a drop in speed of 3 or 4 per cent from no-load to full-load, shaft governors may be made very stable; such governors would be very little affected by variations of speed of a fraction of a per cent during the revolution, but would respond steadily to the mean speed.

It goes without saying that, if the alternators in parallel are to divide the load between them in proportion to their ratings, the governors on the engines should have the same speed-load characteristics; that is, they should all give the same speed at the same fractions of rated load.

Revoking American Letters-Patent.

BY AN ENGLISH BARRISTER-AT-LAW.

There appeared in the *Electrical World* of Jan. 7, page 97, a note of a case in which the Comptroller-General in England revoked a patent held by a person foreign to England. The Comptroller-General did this on the ground that the patent was not worked in England. He exercised the powers which were conferred upon him by a recent act of the English Parliament. In that case the victims were a Belgian firm; we have now to record a case which is of greater interest to American inventors, because it has involved the revocation of a patent held by an American firm.

The invention in question is a sewing-machine for producing a lockstitch, which is capable of operating at a high rate of speed upon either thick or thin work. Up to the present time the machine, which is the subject of a patent granted in 1896, has been wholly manufactured in the United States, but before selling it in England it was the practice of the patentees to remove a few parts and substitute others manufactured in England. It is not patented in Germany; and it was alleged before the Comptroller that the applicants for revocation were about to become agents for certain manufacturing firms in Germany and elsewhere, for whom they desire to sell sewing-machines which are made by such firms in accordance with the patent, and, if sold in the United Kingdom, would be an infringement of the patent.

In resisting the application for revocation, and in order to explain why the patent was not manufactured in England, the managing director of the American firm stated "that it would scarcely be possible to manufacture the machine entirely in the United Kingdom, by reason of the fact that neither the necessary tools nor the high-class skilled labor required could be procured here; that every part of the machine required the utmost skill and precision in manufacture; that the sewing-machines, so far as they were manufactured in America, were manufactured by a firm at Providence, R. I., who were the best tool manufacturers in the world, and that no other firm, to his knowledge, was capable of turning out such refined work as was required in the course of the manufacture. Mr. Smith, the mechanical expert of the company, stated that there were about 75 patented parts in the machine, and that in his opinion there were some 10 of these parts that could not be manufactured in this country by any plant at present in use here."

It is very instructive to examine the way in which the Comptroller dealt with the points raised. In the first place, he said, the English demands for the patented article could not be met by the manufacture of a comparatively small number of the component parts in England. He also came to the conclusion that the patentees had not given an adequate reason for not manufacturing in Great Britain. He said: "An attempt has been made to show that it is impossible to make the machine in England. It is very natural that the patentees and their employees should believe that their machine is a better one than anyone else can produce, and that the American firm which has done their work well for 40 years is the best tool manufacturer in the world. But it is manifest that opinions of this kind must be received with considerable hesitation, having regard to the high-class machinery turned out in England and on the Continent; that, even if they can be substantiated, they would not, of themselves, afford a satisfactory reason for not manufacturing in the United Kingdom. . . . I doubt very much whether the protection which, it is suggested, the users of these machines would derive from the continuance of the patent (i.e., protection from imitation machines) is quite the kind of protection which they themselves desire or require, and whether they would not prefer that the trade should be freed; that they should have the opportunity of testing the qualities of some of these much-maligned German sewing-machines, which cannot be brought into this country so long as the patent remains in force. The patent has rather less than two years more to run in the ordinary course, and, according to the evidence of the managing director of the company, it would be between 5 and 10 years from the present time before the company could be in a position to make the machine completely in this country." Eventually, because he found that the patentees had taken no steps whatever to work the patent in England, he ordered revocation, subject to an appeal to the law.

There is one point about this case which deserves special notice. The object of the recent act, which enables the English courts to revoke patents not worked in England, was, primarily, to cause those patents to be so worked in order to give employment to the British artisan. In the case under review it was not even suggested by those who sought to deprive the American patentees of their property that a revocation order would have this effect. On the contrary, the avowed object of the move was to assist a German manufacturer who has been longing to find a market for his sewing-machines in England. Arguing by analogy, it will be competent for any person in the world to "queer the pitch" for an American inventor who is importing manufactured patented goods into England. His motives will not be inquired into.

It may be that this state of the English law will press hardly upon the American inventor; but signs are not wanting that the enthusiasm which was at first shown for the act in English political and commercial circles is gradually abating. This was the first step toward fostering British industry; the foundation of Protection for the United Kingdom! But to every piece of legislation there are objections which only become apparent when the readjustment of the law has taken place. Further, experience has shown that, in England and elsewhere, the most skilful draughtsman of a statute is unable to perform his task in such a way as to prevent the law being evaded.

In the first place, it has been found that the new act has adversely affected the number of inventors foreign to England applying for patents in that country. America heads the list, while Germany, France and Switzerland follow in the order named. Altogether, the foreign applications show a reduction of 8½ per cent. This means a serious diminution of the revenues of the English Patent Office.

There are divers courses open to the inventor foreign to England which will enable him to avoid having to set up a factory on British soil. In the first place, he may manufacture the parts of a complicated machine, and have them assembled in England. The point has not yet been decided, but the English courts may hold that this constitutes manufacture.

With regard to other methods of evading the stringency of this measure, it is impossible to do better than quote the following passage from a letter from an English patent agent, which appeared in the London *Times* of Jan. 6:

"It is now open to the foreign patentee to follow one of two courses. In the first place, where he knows that he can manufacture his improved article abroad and import it into England at a price slightly lower than that at which it could be sold if manufactured in England, he will refrain from making application for a British patent. There will similarly be no object in obtaining a British patent in the case of a complicated machine which the patentee knows well is not likely to be made by anyone who does not hold the monopoly. The other course open to the foreign patentee is to apply for and obtain a British patent, but allow it to lapse at the end of the fourth year before any question of proceedings under section 27 can arise. During these four years the patentee has had the monopoly and will have been able to obtain such an advantage on the English market with his imported goods that he can in a large majority of cases disregard the competition resulting from anyone who subsequently desires to manufacture in Great Britain. Manufacture abroad and importation by a competitor can easily be prevented by obtaining patents covering the likely countries, the patentee himself naturally manufacturing where the work can be done most cheaply, and thus complying with the local requirements as to working.

"I shall be glad to have it pointed out where the country is going to benefit in either of these cases, which I may say are not at all imaginary. So far from being a gainer, England will actually be the loser by the amount of the fees on the patents which will not be applied for or kept up."

Effect of Physical Differences of Red Lead on Storage Battery Plates.

By Henry C. Frey.

Red lead as sold in the markets is made by two processes—namely, the old process in which the litharge obtained by oxidizing metallic lead in the open oxidizing furnaces is calcined further until the mass shows a desired shade of red. The other process, known as the "Nitrite" process, is an indirect method of manufacture. There is a marked physical difference in the resulting product of these two processes. The red lead made by the "Nitrite" process is much more bulky and also lighter in color than red lead made by the old method. Of course, the lightness of color in the "Nitrite" process is explained by the product being perfectly amorphous, while the red lead of the old method is crystalline and much denser.

There are some makers of storage batteries who prefer for positive plates the red lead made by the old method, but seemingly without any particular reason. To overcome the density of the paste plates such inert matter as powdered pumice stone, coke, carbon, lampblack, etc., have been used. The addition of such material has been found deleterious to the life of the plate, as well as to the proper chemical action. As I have stated, the red lead of the old method is crystalline, and at the same time these minute crystals are vitreous. It will be found that this objectionable property affects the final finished plate, inasmuch as it does not allow of charging at the rate that ordinarily would be expected. Now, in the case of red lead by the "Nitrite" process the product is absolutely amorphous, and bulky, which imparts to the plate a proper porosity and at the same time results in a lighter plate, while, being amorphous, rapid reaction of the electrochemical change in the plate is facilitated.

Plates made with "Nitrite" process red lead have given longer life than plates made with red lead by the old method. Then again, the latter material contains in some instances as high as 40 per cent of free litharge. This large amount of free litharge is undesirable for positive plates, although an average of 10 per cent of free litharge has been found advantageous. "Nitrite" process red lead will contain very often much less than 10 per cent, and even as low as one-fourth of 1 per cent of free litharge has been found. The most reliable method for determining the amount of free litharge in red lead, in the absence of adulterants, is the one used by Dunlap (*Jour.* Amer. Chem. Soc., XXX (4), 611). I have used this method and find no room for improvement, as results have always been very accurate.

CENTRAL STATION

MANAGEMENT, POLICIES AND COMMERCIAL METHODS

Flaming Arcs on Flat-Rate Contracts in Chicago.

The Commonwealth Edison Company in Chicago now makes the following flat rates on flaming arc lamps, the lamps to be maintained and turned on and off by the company's regular patrolmen. The company maintains a large force of patrolmen on its flat-rate electric signs and tungsten clusters, turning them on and off at stated hours, and noting necessary lamp renewals. The rate on the regular flaming arc from dusk to midnight is 51 cents per night; from dusk to 1 a. m., 56 cents, and from dusk to dawn, 81 cents. This is subject to a discount of 25 cents per week per lamp for payment within 10 days from the issuance of bill. These prices are based on the assumption that the consumer owns the lamps and the company simply maintains, trims and switches on and off. If the company owns the lamps, a rental charge of $1 per week is made.

Electric Heating and Cooking at Grinnell, Iowa.

Mention has been made from time to time in the *Electrical World* of the unusually extensive introduction of electric heating and cooking devices by the Grinnell Electric & Heating Company, under the management of Mr. O. K. Cole. This company operates in a town of 5000 inhabitants where there is no gas competition. It is the aim as far as possible to make electric heating and cooking take the place which would otherwise be filled by gas.

The company gives a rate of five cents per kw-hour for cooking and heating appliances when placed on a separate meter. It had connected at the first of the year 18 of these special heating meters. These were on complete cooking outfits and other heating and cooking installations large enough to justify a separate meter. It is not to be understood that all of these 18 were complete cooking outfits, as many consumers have purchased certain appliances which appeal to them most on account of their convenience. Besides these 18 special heating circuits, there are a large number of miscellaneous appliances operated from the lighting circuit at the regular rate of 10 cents per kw-hour. These appliances in the order of their numerical importance are as follows: (1) Flatirons, (2) disk stoves, (3) coffee percolators, (4) frying pans, and (5) toasters. There are about 400 flatirons connected. Assuming that most of these irons take 0.5 kw, the interesting fact is deducted that the company has connected half a kilowatt in electric irons for every kilowatt of station capacity, as the station capacity in kilowatts is 400. On other devices than electric irons we have no accurate record, but it is interesting to know the relative popularity of the different devices. The disk stove appeals to many because it can be used for so many different purposes. The coffee percolator comes third on the list, the frying pan fourth and the toaster fifth. Toasters have begun to take rapidly, however, with the introduction of the new General Electric toaster, and nine of these were sold as soon as this toaster was exhibited before the holidays. This device may, therefore, pass some of the others in numbers before long.

It would be interesting to know whether any other central station has exceeded this record in the introduction of heating devices, station capacity and population served being considered.

Meter Testing in Sioux City, Ia.

The Sioux City Gas & Electric Company has adopted the plan of testing consumers' meters by a combination of the methods of testing on consumers' premises and testing at the meter department. As a start, the 1200 electric meters which this company has out are to be brought in and tested at the meter department.

It is estimated that two men, one for bringing in and replacing meters and the other for testing at the department, can go over these 1200 meters in about 40 working days, or at the rate of 30 per day. A board has been fitted up for rapid testing at the department. After this complete test of all the meters has been made at the department, a plan will be inaugurated of testing meters on consumers' premises once a year and bringing them in for test once a year, thus making six months between tests. This plan to a certain extent will combine the advantages of the two methods.

A New Display Room for the Commonwealth Edison Company of Chicago.

The Commonwealth Edison Company, of Chicago, opened its magnificent new display room Jan. 16, coincident with the opening of the Electrical Show. This display room, which is called the "Electric Shop," is located on one of the finest down-town corners in Chicago, on the main floor of the Railway Exchange Building, Michigan and Jackson Boulevards. In this display room everything pertaining to application of electricity

ANNOUNCEMENT

We cordially invite our customers and the public generally to visit *Electric Shop*, the newly opened electrical show rooms of this *Company* on the ground floor of the Railway Exchange Building, corner of *Michigan* and *Jackson Boulevards*.

These rooms are devoted to the demonstration and sale of *electrical* equipment and devices for use in the home, and no pains have been spared to acquaint our patrons with the most recent developments in this field.

COMMONWEALTH EDISON CO.

NEWSPAPER ANNOUNCEMENT OF OPENING OF ELECTRIC SHOP.

in the household is to be shown. No expense has been spared in the equipment of this room. In the basement of the same building a display of electric motor applications of the more common and popular types is to be made. The accompanying illustration is a reproduction, considerably reduced, of the announcement in the Chicago newspapers of the opening of the "Electric Shop."

Central-Station Improvements at Columbus, Neb.

The electric light plant at Columbus, Neb., was purchased last year by gentlemen who formed the Columbus Light, Heat & Power Company. The old power plant is being entirely abandoned and a new plant has been built in another location. Much of the distributing system has also been rebuilt. The new plant is an unusually fine one for a town of this size. The population of Columbus in 1900 was 3522, and is probably now between 4000 and 5000. The old plant gave 133 cycles single-phase alternating-current night service only and had some direct-current arc machines for street lighting. The new plant gives 60-cycle, 2300-volt, three-phase all-day service.

FIRE-PROOF BUILDING.

The station building is absolutely fireproof, being of brick with concrete floors and reinforced concrete roof. The building dimensions are 50 x 70 ft. over all and the walls rise 18 ft. above the ground level. Of this space 25 x 30 ft. is occupied by the engine room. This engine room is 16 ft. high and has a basement 7 ft. high for condensing apparatus under its concrete floor. The engines are direct-connected, medium speed, cross-compound, four-valve condensing. One is connected to a 200-kw Allis-Chalmers alternator and the other to a 125-kw alternator. The 200-kw unit runs 200 r.p.m. and the 125-kw unit 225 r.p.m. The cost of this station is stated to be about $100 per kw, exclusive of the building, which latter cost about $28 per kw.

As steam coal is high in Nebraska, costing about $4 per ton at Columbus, condensing in small plants is more common than in adjoining Eastern States. Condensing water is obtained from wells on the property, from which there is a suction lift of about 10 ft. to the condensers. Condensing is doubly attractive in this case because the company has succeeded in making a contract with the Union Pacific Railroad, which will take most of its condensing water.

The engines are equipped with new type so-called Corliss valves. The makers' guarantee is 14.75 lb. steam per hp-hour. In the basement of the engine room is one Platt Iron Works condenser. There are two boilers, 72 in. x 18 ft., of the horizontal return-flue type. A peculiar feature of this plant is the forced draft whereby heated air is supplied from the ash pits by means of a fan blower. This blower, which is direct-connected to a 5-hp engine, forces air into the ashpits through three 10-in. wrought iron air pipes, which pass from the rear of the boilers forward through the combustion chamber, so that the air becomes heated during its passage to the ashpits. The boilers were manufactured and supplied by the Murray Iron Works.

The company has a contract to pump water for the city for five years. The city pumping plant is near the electric light plant. In this plant the city installs two 2300-volt 20-hp induction motors. The city owns the pumps and motors, but the company has to keep them in order. The city pays 7 cents per 1000 gal. pumped. The pumps operate against 100-ft. head. The city requirements are from 100,000 gal. per day in the winter to 300,000 in the summer. There are two 500,000-gal. per day pumps, each driven by a 20-hp induction motor. Previous to the starting of the new plant there was no day service in the town. As an evidence of how quickly day service will come when the public is convinced that the company has a plant which is capable of giving continuous service, it may be mentioned that this company had 200 hp in motors awaiting it when it began day service.

A TRADE FOR TUNGSTEN STREET LAMPS.

In view of the advent of the tungsten lamp for street lighting, it is interesting to note that this company has made a trade with the city whereby tungsten lamps are to be substituted for arc lamps. The city contract called for 5-amp series alternating-current enclosed arcs at $70 per lamp per year on a moonlight all-night schedule. The city agreed to exchange one arc lamp for two 60-cp tungsten lamps. The tungsten lamps are to be placed on every corner. The price of the 60-cp tungstens is therefore to be $35 per year on a moonlight all-night schedule. There are to be 40 of these 60-cp tungstens and also 40 32-cp tungstens, the latter to be paid for at $15 per lamp per year.

The officers of the company are: President, W. C. Ross, of Omaha; vice-president, John T. Burke, of Columbus, and secretary, John W. Parish, of Omaha. The company's new plant has been erected under the management and supervision of Mr. Burke.

Central-Station Exhibits at the Chicago Electrical Show.

The exhibit of the Commonwealth Edison Company at the Chicago Electrical Show was, of course, one of the largest single features of the show, as the object of the show is to appeal specially to the possible electric consumers of Chicago and therefore give the company an excellent opportunity to get before its public. Last year this company had for its exhibit the "House Electrical." This year an industrial power exhibit was decided upon. This exhibit (of which some idea can be obtained from the accompanying engravings) covered a large range of power applications. Along with this exhibit the company issued a 24-page pamphlet, describing the different

applications of electric power shown in the exhibit. The exhibit in reality consisted of several small factories of different kinds, most of which were conducted by large manufacturing concerns of Chicago which are users of Commonwealth Edison power. For example, J. T. Ryerson & Son, large iron and steel workers of Chicago, occupied one section with some very powerful metal-working machines. Among them were included the

FIG. 1.—COMMONWEALTH EDISON EXHIBIT.

Ryerson friction saw, a Lennox rotary bevel shear and a vertical punch.

A moving-picture machine, so located as to be easily inspected, was kept in operation by the Viascope Manufacturing Company, of Chicago, thus illustrating an application of electricity which has found its way into the smallest villages of the country and has helped to swell the revenues both of large and small central-station companies. In the line of wood-working machinery, the Lochman carving machine showed some of the wonderful work done in the wood-working industry. The Haffner Furniture Company, of Chicago, also showed in operation a wood-embossing machine.

Bakers' machinery of various kinds, including a dough and cake mixer and a Morten beater, were operated in a section

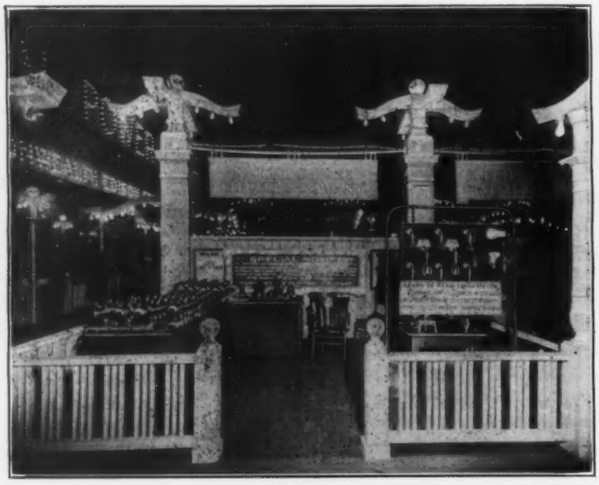


FIG. 2—COMMONWEALTH EDISON EXHIBIT.

under the control of H. H. Kohlsaat & Company, Chicago, bakers. For the baking four electric ovens were employed of General Electric and Simplex manufacture. The Strauss Underwear & Stocking Company operated a number of knitting machines. *The Electric City,* the Commonwealth Edison publication, occupied one end of the exhibit with a linotype machine and printing press. Another branch of the printer's industry was represented by embossing presses of two different makes.

In connection with central-station advertising of the Electrical Show in Chicago, one of the notable things this year has been the extensive use made of cartoons. Nearly every day cartoons about the show of one kind or another appeared in the Commonwealth Edison advertisements in the daily papers, and in

FIG. 3.—COMMONWEALTH EDISON EXHIBIT.

advance of the show a number of the daily papers had cartoons of their own relative to it, most of them being about household applications of electricity of various impossible and ridiculous kinds, which nevertheless tended to bring to mind the numerous uses to which electricity is being put in the home.

THE NORTH SHORE ELECTRIC COMPANY EXHIBIT.

The exhibit of the North Shore Electric Company, which operates in suburban districts, and may be termed a suburban cousin of the Commonwealth Edison Company, made a very simple display this year, but one which was good advertising because of this simplicity. Along one side was an enormous display of Pacific electric irons. In common with the Commonwealth Edison Company, the North Shore Electric Company

FIG. 4.—COMMONWEALTH EDISON EXHIBIT.

recently started out to loan free to its consumers a large number of electric flatirons. On the other side of the booth was a board containing a recording wattmeter and an indicating wattmeter, calibrated to read in cents. Thus the rate of consumption in cents per hour with a different number of lamps burning could be seen at a glance. The speed of the meter could also be easily shown.

Cost Keeping in the Central-Station Contracting Department.*

Among the papers presented at the recent meeting of the Northwestern Electrical Association is one by Mr. Ludwig Kemper, manager of the Albert Lea (Minn.) Light & Power Company, entitled "Cost Keeping in the Contracting Department." The writer said that in the case of his company, whose contracting work amounts to about $10,000 annually, it is found each year that instead of having actually made a profit of 8 or 10 per cent, as shown by the books, an actual loss of 8 to 10 per cent was incurred, and it was therefore decided to install a stores department.

The storekeeper is a man with experience in wiring and meter testing; he is also timekeeper, and, in addition, he repairs everything that comes in the shop, as fans, irons, arc lamps, motors, etc.; he also tests and repairs meters brought in from the line. He reports direct to the superintendent.

On establishing the department the cost of running it was estimated by taking 75 per cent of the storekeeper's wages, allowing 25 per cent for repair and meter work, estimating freight and drawing expenses, and charging for rent, light, heat, insurance and taxes. Having the total estimated business and total estimated expenses, a percentage is added to invoice prices to cover the cost of doing business. On top of this is the percentage for profit. This method discriminates in favor of certain material, but it saves a good deal of work and thus far it has worked out satisfactorily.

All material bought for use in more than one department is charged to the material in stock accounts. Material, such as coal, oil, packing, etc., which is used in one specific department only, is charged to specific accounts direct, and does not enter the storeroom at all, but is accounted for to the manager through the superintendent by the men in charge of these departments.

All material wanted is ordered on a requisition in duplicate, the original going to the manager, the duplicate being retained by the signer of the requisition. The storekeeper makes the requisitions for the material in stock articles, the superintendent for all supplies not entering the storeroom. All requisitions are numbered, those of the superintendent having the letter "A" affixed to the number. The manager then makes out orders in triplicate for the material, if it meets with his approval. The original order (white) goes to the jobber, the duplicate (blue), with the requisition attached, is filed in the office; the triplicate (pink) goes back to whoever made the requisition.

On the pink slip, the quantities of material ordered are not entered, so that the storekeeper or the superintendent does not know how much of each item is ordered, and on arrival of the goods he has actually to count and check them. When the material arrives it is checked and the quantities are entered on the back of the triplicate, and when the order is filled completely it is signed and returned to the office. There the pink slip is attached to the blue one and the requisition, and later on to the invoice, when it arrives. After the prices are O. K.'d, this file goes to the bookkeeper, who audits a voucher to which the bill is attached, which is entered on the voucher register. When the bill is paid, the check number is entered on the voucher and the voucher with its attachments is filed when receipted and returned by the jobber. In this file there is then a complete history of every order, and if occasion arises to look up an order, the entire transaction is found with the voucher.

All material going into the storeroom is entered in a stock book, which is made up of loose leaves. These stock sheets are made up once a month, when material on hand must be checked with that actually in the storeroom.

When an employee wants material for a job, he signs a receipt and he is held responsible for this material. When the job is completed, the returned material is credited on the receipt. On a charge ticket is then entered the material and labor, with its price. From these charge tickets are made out the bills which are sent to the office for entering on the customer's ledger and for distribution.

The cost price of the jobs at the bottom of the charge tickets is footed up at the end of the month and credited to "Material" in the stock account. If the work is done for some department, the procedure is the same, this department being billed at the end of the month, the same as a customer, with the exception that it is billed at cost price, instead of cost price and profit. From the charge tickets the different items are credited on the stock sheets in the column "Charged out during." This completes the record of the material from the requisition until the charging out.

Everybody on entering the employ of the company receives a number and time card, which he has to punch on a recording time clock every time he enters and leaves the building. Whenever he goes out on a job for material in stock account he punches out; when he returns, he punches in again, and his time is taken from this time card and entered on the charge ticket. At the end of the day his total material in stock time is entered on the back of the time card. When he works for some other account, which is always company's work, his time is not entered on a charge ticket, but on the back of the time card in the column designating the account for which the work was done. At the end of each day his working hours as printed by the recorder have to check with the time charged out on the back of the card.

Semi-monthly on payday these cards are sent to the office for approval by the manager, after which they are entered on a payroll sheet, distributing the amounts to the various accounts. When the man is paid, he has to receipt and date his time card and the complete record of his work and earnings during this period is on the card.

This system of keeping track of material and labor is more simple in actual practice than it appears from the description. It makes clear what every job costs and enables the costs of the work to be checked with the estimated costs. The prices to the public have been uniform and lower than when there was no system, but the net profits have been larger.

The system is flexible when started with a good man at the head instead of a cheap one. During the summer it was decided to test all electric meters; this was more than the storekeeper could do in a short time besides his other duties, so a cheaper man was hired as his assistant, and the two of them tested all meters and did the other regular work. When the meters were tested, the assistant was laid off. If the storekeeper had not been a man with meter experience this could not have been done.

*A paper read at the Northwestern Electrical Association convention, Milwaukee, Jan. 20 and 21, 1909. Mr. Kemper is manager of the Albert Lea (Minn.) Light & Power Company.

Testing Electric Meters.

In a paper presented at the recent annual Northwestern Electrical Convention entitled "Control of the Adequacy of Electric Service," Mr. Frank A. Vaughn, electrical engineer of the lighting department of the Milwaukee Electric Railway & Light Company, gave an account of the measures adopted by his company to meet the requirements laid down by the Wisconsin public service commission (Railroad Commission of Wisconsin), in regard to the testing and maintenance of customers' meters.

The provisions of the Wisconsin public utility law require that the commission shall "ascertain and fix adequate and serviceable standards for the measurement of quality, pressure, initial voltage or other condition pertaining to the supply of the product or service rendered by any public utility, and prescribe reasonable regulations for examination and testing of such product or service and for the measurement thereof. It shall establish reasonable rules, regulations, specifications and standards to secure the accuracy of all meters and appliances for measurements, and every public utility is required to carry into effect all orders issued by the commission relative thereto." In one of its reports the commissioners state that "adequate

service is not necessarily the best service which it is possible to give, but rather the best service which can be given with due regard to economy to the consumer and to the company. The kind of service prescribed should not be materially different from that furnished by companies operated under the best management and giving the best service. In formulating definitions of adequate service and rules for securing the same, recognition must be made of the rapidly changing conditions to which the electrical energy supply industry is subjected. It is also obviously desirable that rules should not be adopted which shall interfere with the natural growth or progress of the industry."

The commission has formulated the rule that adequacy of electrical service may be considered according to the following

The Milwaukee Electric Railway and Light Company.

METER TEST RECORD

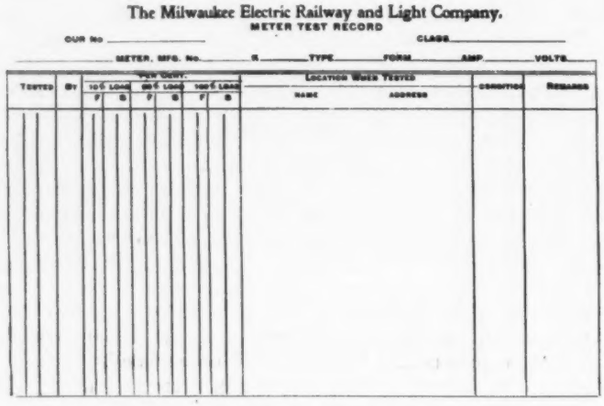


FIG. 1.—METER TEST RECORD.

classification: Accuracy of meters, regulation of pressure, and efficiency of devices for utilizing electrical energy.

Mr. Vaughn states that for best average accuracy a meter of a full-load rated capacity of not more than two-thirds of the connected installation should be used. On this basis the meter will carry a load somewhere near its full-rate capacity with occasional maximum overloads which will be well within the limits of heating and correct registration, and the light-load consumption will be such a percentage of the full load as to insure just registration, light load being defined in the neighborhood of 10 per cent or 20 per cent of the full-load capacity. The paper then takes up the discussion of various rules established by the commission. In regard to the rule that "no electric meter shall be placed or allowed to remain in service which has an error of registration in excess of 4 per cent on light load, half-load or full load," he says it ought to be a comparatively easy matter to obtain the accuracy called for immediately after adjustment, but that the error of 4 per cent will probably be exceeded after a meter has remained in service for some time and it will therefore be necessary to inspect and adjust all meters periodically. It is pointed out that the error of registration allows a range of 4 per cent fast to 4 per cent slow. Another rule allows a consumer to request a meter test as frequently as once in six months.

The accompanying illustration shows the record adopted by the Milwaukee Company to meet the requirements of a rule which specifies that a complete record shall be kept of all tests made on electric meters.

The records called for by Rule 18 are, it is believed, very well covered by Form 815 (Fig. 1).

As to the equipment for testing meters to any particular type or method, the commission says:

"It is impossible to specify in detail the methods and instruments which should be employed in testing electric meters. There are various standard instruments which give satisfactory results and manufacturers are continually making improvements in testing equipments. It is the purpose of the Railroad Commission, through its engineering staff, to keep informed regarding the improvements which are being made and of the various approved methods of testing, and from time to time such information will be placed at the disposal of the electric companies operating in this State."

Following are the details given of the meter-testing system of the Milwaukee Company in order to meet the requirements of the commission:

Before a meter is installed, after receipt from the factory, or after having been returned from a cut-off, it should be thoroughly tested and inspected in the Electrical Testing Bureau.

Alternating-Current Meters.

Test meters on light load (10 per cent or 20 per cent), half load (50 per cent) and full load (100 per cent), based on rated capacity of meters. Use a master wattmeter with 1 amp, 10 amp and 20 amp coils, comparing revolutions made in approximately 30 seconds by calibrator and by meter being tested. For the larger capacities use current transformers with 5 amp secondary winding in conjunction with calibrator. Time to be measured by a standard stop watch, graduated in fifths of seconds. The ratio of the revolutions of meter being tested to the revolutions of calibrator is the accuracy of the meter in per cent.

Adjust meter so as to register at least within the limits of 99 per cent to 101 per cent accuracy—that is, with not more than 1 per cent error, either fast or slow. For testing load use suitable rheostats or lamp banks for all loads, except for starting load a low candle-power incandescent lamp. All meters up to and including 25-amp rated capacity should start on a 2-cp incandescent lamp; beyond this and up to and including 100-amp capacity on a 6-cp lamp.

Direct-Current Meters.

Test meters on light load (10 per cent or 20 per cent), half load (50 per cent) and full load (100 per cent). For measuring volts use a voltmeter with triple scale, reading 0 volt to 150 volts, 0 volt to 300 volts and 0 volt to 750 volts, and for measuring amperes a millivoltmeter with scale of 150 divisions and the necessary shunts to read the required load for comparing seconds required by meter being tested to make $\frac{\text{ampere} \times \text{volts}}{\text{meter constant}}$ revolutions, with number of seconds required for 100 per cent accuracy, using "per cent error curve" (Fig. 2). Time to be measured by a standard stop-watch graduated in fifths of seconds. Adjust the meter so as to register at least within the limits of 99 per cent to 101 per cent accuracy—that is, with not more than 1 per cent error, either

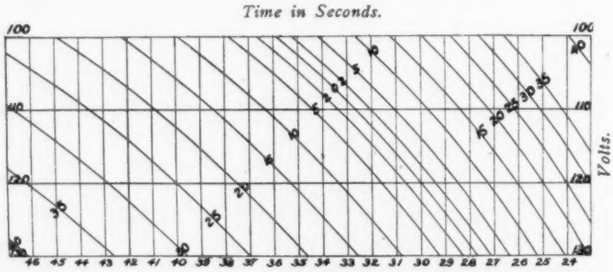


FIG. 2.—PER CENT ERROR CURVES.

fast or slow. For testing load use suitable rheostat or lamp banks for ordinary loads, and a low candle-power incandescent lamp for starting load. All meters up to and including 10-amp rated capacity should start on a 6-cp incandescent lamp, balanced to start on 2 per cent of rated capacity.

Tagging Meters.

When a meter is adjusted to required accuracy and inspected, an aluminum name-plate is attached to the outside of the cover, giving the information covered by Fig. 3. The hand on the smallest reading dial is then set on 9, and the others at zero, which indicates that the meter has been adjusted, and allows a small amount of current to be used when installing and trying out at customer's premises, without affecting customer's bill. The meter disk and moving parts are then securely blocked and

the meter is placed in stock of meters ready for installation, whence it is subsequently taken out to be installed.

Recording Tests and Inspections.

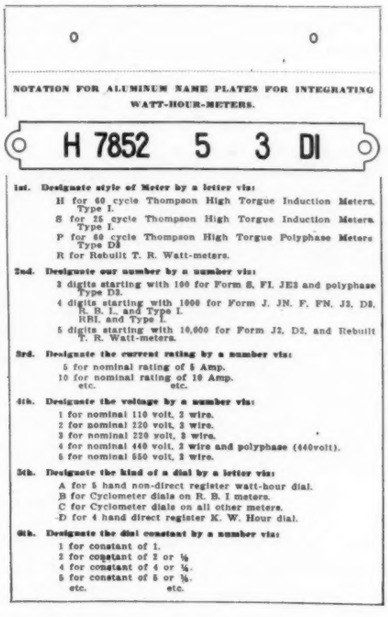
The record of all tests and inspections is kept on a form and the results are transferred to that shown in Fig. 1, which is a continuous history of the individual meter and is kept on file and up to date as long as the meter exists, as explained below. The original record should be kept on file for two years. When, according to the rulings of the Railroad Commission of Wisconsin, special or request tests are made in the laboratory after "cut-off" or for other reasons, the data on such tests are entered on the original record form, which is filed with the customer's records, and the results transferred to the form of Fig. 1, as a part of the history of the individual meter.

The meter being now properly calibrated and installed, its periodical tests and inspections proceed in this company as follows:

Testing at Customer's Premises.

After a meter is installed it must, within three months from that date, be tested and inspected at customer's premises, and periodical, special or request tests and inspections must be made thereafter to conform with the ruling of the commission.

Adjust the meter so as to register at least within the limits of 98 per cent to 102 per cent accuracy—that is, with not more than 2 per cent error, either fast or slow. For testing load use


NOTATION FOR ALUMINUM NAME PLATES FOR INTEGRATING WATT-HOUR-METERS.

H 7852 5 3 DI

1st. Designate style of Meter by a letter viz:
H for 60 cycle Thompson High Torque Induction Meters. Type I.
S for 25 cycle Thompson High Torque Induction Meters. Type I.
P for 60 cycle Thompson High Torque Polyphase Meters. Type DS
R for Rebuilt T. R. Watt-meters.

2nd. Designate our number by a number viz:
3 digits starting with 100 for Form S, FI, JE3 and polyphase Type DS.
4 digits starting with 1000 for Form J, JN, F, FN, J3, DS, R, S, I, and Type I. RBI, and Type I.
5 digits starting with 10,000 for Form J2, D2, and Rebuilt T. R. Watt-meters.

3rd. Designate the current rating by a number viz:
5 for nominal rating of 5 Amp.
10 for nominal rating of 10 Amp.
etc. etc.

4th. Designate the voltage by a number viz:
1 for nominal 110 volt, 2 wire.
2 for nominal 220 volt, 2 wire.
3 for nominal 220 volt, 3 wire.
4 for nominal 440 volt, 2 wire and polyphase (440volt).
5 for nominal 550 volt, 3 wire.

5th. Designate the kind of a dial by a letter viz:
A for 5 hand non-direct register watt-hour dial.
B for Cyclometer dials on R. S. I meters.
C for Cyclometer dials on all other meters.
D for 4 hand direct register K. W. Hour dial.

6th. Designate the dial constant by a number viz:
1 for constant of 1.
2 for constant of 2 or ½
4 for constant of 4 or ¼.
5 for constant of 5 or ⅕.
etc. etc.

FIG. 3.—REPRODUCTION OF ALUMINUM NAME PLATE.

the customer's installation and a lamp bank, of 20-amp maximum capacity in conjunction for regulation, or for larger capacities, a fiber waterpail rheostat with large carbon electrodes.

The rule requires a test no oftener than once a year, but some meters in very important installations involving a large amount of income will be watched more closely than this in justice to both contracting parties, and the exact time which any meter should remain in service before being inspected is dependent on local as well as general conditions.

The above routine methods do not take up specifically the testing of very large meters, as for apparent reasons these will require more or less special and specific treatment along well-known lines. Their use should also be discouraged for a customer's installation.

The question of the policy of testing a meter on the customer's premises is also one which has been very thoroughly gone over, and it is assumed that the request of the commission to test "the meter while connected in its place of service" will willingly be complied with, by any company, where there is more than one man to operate the plant and test the meters. The commission also requires: "In addition to the installation test and the yearly test made upon each meter, it is desirable that provision be made on the part of the company for testing meters at other times upon request of any consumer who believes his meter to be registering inaccurately. It is a common practice among electric companies to make these tests free of charge. The following seems to be, therefore, a desirable provision: Each company supplying electrical energy shall make a test of the accuracy of a meter upon request of a consumer, provided such consumer does not make request for tests more frequently than once in six months. A report giving the results of such tests shall be made to the consumer, and a complete record of the same shall be kept on file in the office of the company."

Another rule is that: "Upon formal application of any consumer to the Railroad Commission, a test shall be made upon the consumer's meter by an inspector employed by the commission, such test to be made as soon as practicable after the receipt of the application. For such test a fee of two dollars ($2) shall be paid by the consumer making application for the test if the meter is found to be slow or correct within the allowable limit, and by the company owning the meter if the meter is found to be fast beyond the allowable limit."

This rule should not interfere with the very laudable practice, followed by most companies, of encouraging the consumer to bring his troubles and complaints to the notice of the proper official of the company, when, if reasonable, a meter test or entire change of meter is willingly allowed for the satisfaction of the customers.

INTERIOR WIRING AND ILLUMINATION

Christmas-tree Street Decorations.

At Des Moines, Ia., before the holidays, the merchants along one of the streets purchased enough evergreen trees to place one approximately every 20 ft. along each curb. These were supported in large sewer tiles filled with sand, the tree trunk being braced inside of the tile, and were lighted day and night by various colored electric lamps. This move was carried out entirely by the merchants along the street. At Grinnell, Ia., a similar scheme was inaugurated, 27 trees being placed in a block and a half. The relative effects of these two installations brought out the importance of selecting the right kind of trees for this work in the future. At Des Moines the trees had the branches thoroughly open. At Grinnell trees in which there was little space between branches were used. The trees in which the branches were open presented by far the better appearance, as they allowed the lamps to shine through the leaves and between the branches. On the trees with branches close set and with thick leaves, many of the lamps were hidden and the effect was disappointing. Energy in both cases was purchased by the merchants at the regular rates. The business in both these cities was looked upon as desirable, purely on account of the possibility that it would lead to some permanent special down-town street lighting.

Trees High and Low.

In many towns early difficulties experienced with tree trimming forced the pole lines into the alleys as much as possible, which is the best place for them. But frequently it happens that in towns in which the street conditions are most difficult for pole lines there are no alleys. Conditions as regards height of trees vary so much as to suggest three general methods of procedure. In some cities the size and height of trees are limited by ordinances or by natural conditions which have

prevented the growth of trees to great height. In such cases there is the possibility of running the lines above the trees on very high poles. After this is done the trees are kept trimmed to a uniform height of, say, 35 ft. In another class of towns where the soil is very fertile, so that trees grow rapidly, and where the trees are of considerable age, they have exceeded any possibility of trimming to a uniform height to permit running of wires above. In fact, the rapidly-growing soft maple trees in the fertile soil of Iowa and some other Central States have attained such size as to suggest the feasibility in the future of using on the older streets very low pole lines, keeping all lines entirely beneath the trees and trimming accordingly. Where one can go above or below the trees conditions are easy to meet, although high pole-line construction is expensive. The main trouble comes where the trees are too small for lines to go below and too high for them to go above. It is, of course, true that with rapidly-growing trees, lines which are now among the boughs, where frequent trimming is necessary, will in a few years be below them. In the meantime, the conditions are trying. As the trees in a town get older and larger, the tendency will probably be more and more to go below rather than among or above the trees.

Special Street Lighting in Poughkeepsie, N. Y.

The city authorities at Poughkeepsie, N. Y., have recently adopted ornamental double-bracket arc lamps for the principal business streets of the city and the merchants along these streets have also manifested an interest in outside illumination, with the result that many of them have installed extra circuits for outline and other forms of display lighting. What has heretofore been a dimly-lighted thoroughfare as a consequence has been suddenly transformed into a well-illuminated avenue, and

POUGHKEEPSIE STREET LIGHTING.

the sudden awakening is beginning to have its effect on the electric light company's load curve. The accompanying illustration shows Main Street at 10 p. m.

The city is also arranging for a grand blaze of light for the coming New York State Convention of Firemen and for the Hudson-Fulton Celebration which is to follow. Plans are now being made for arching Main Street for over half a mile with incandescent lamps. The supervisors recently passed a resolution to outline the County Court House with nearly 1000 incandescent lamps for the Firemen's Convention and other prominent buildings in the city are also to be decorated. The convention lasts four days and the new business department of the Poughkeepsie Light, Heat & Power Company will make an effort to have much of the lighting continued. In its modest way the company has been adding steadily to its circuits and the main streets of the city are becoming as well lighted at night as some of the larger cities in the country.

Concealed Knob and Tube Work Versus Conduit.

By Arthur L. Abbott.

The short article with the title "Concealed Knob and Tube Wiring" in the *Electrical World* for Jan. 14 leads the writer to believe that some discussion of this question might be of some benefit to those interested in methods of interior wiring. The fact that knob and tube work is allowed under the Underwriters' rules cannot be taken as conclusive evidence of the safety of such installations. The code is notoriously behind the times, as witness rule No. 54A on cut-out cabinets, in which is the following:

"When wood is used the inside of the cabinet must be completely lined with a non-combustible insulating material." And further on, "With metal conduit systems, the lining of either the box or the gutter must be of 1-16th in. galvanized, painted or enameled steel, or preferably ¼-in. slate or marble." Here is found, first, a direct contradiction; second, a statement that slate or marble is preferable to steel for the lining of wood cabinets for conduit systems, a statement with which very few construction men or inspectors will agree; third, there is no specification covering cabinets made entirely of steel, such cabinets not even being mentioned. This is the type of cabinet which is used almost exclusively on up-to-date conduit installations.

As a set of engineering specifications, the code is, in many ways, a shining example of what to avoid. It is not logically arranged, and it is very far from being clear and specific on many points. The writer recently asked the electrical inspector of a large city, a man whose competence is unquestioned, the meaning of a certain rule in the code. The inspector replied that he did not know, but had always wondered what the meaning was.

It is true that concealed knob and tube wiring, if installed strictly in accordance with the rules, is perfectly safe, provided it is never disturbed. But who can state positively that this condition is fulfilled in any case? The contractor knows to his sorrow how little respect the plumber, the gas fitter, the steam fitter and the carpenter have for the electric wires in a building. After the roughing-in has been completed, some of the injuries to the wiring are found by the inspector and reported to the contractor, who is usually compelled to repair his work without compensation. Many more such defects are undoubtedly never discovered and are, therefore, a permanent part of the installation. Even if, by good fortune, the wiring happens to be in good condition when the building is completed, there is absolutely no safeguard against subsequent injury while repairs or alterations are being made to the building or its equipment. The infrequent occurrence of fires caused by defective wiring cannot be used as any argument for the continuance of the poorer methods of wiring, for every one in the business knows of numberless cases where the most antiquated forms of wiring and the most flagrant violations of the rules have existed for many years without causing trouble.

It must be admitted that the matter of cost is an open question, though the writer does not believe that the additional cost of conduit work will deter many owners from wiring their buildings. An ordinance was passed in the City of Minneapolis a few years ago requiring conduit work for all concealed wiring except in residences outside the fire limits, and time has demonstrated that this rule has no appreciable effect in impeding the progress of electric lighting. It may be that the class of buildings exempt from the conduit requirement is the one which would be most affected by a universal rule; but the cost of wiring is such a small part of the whole cost of any building that it hardly seems that any owner of a residence would forego the use of electricity on account of the comparatively small sum representing the difference between knob and tube work, and conduit work. Even where it is not required by city ordinances, many owners of the better class of residences prefer to pay the additional cost of a conduit system

for the sake of the greater safety and reliability thereby insured.

A comparison of the costs of the two classes of work is given below for four residences of the better class in the City of St. Paul. Bids were taken on both conduit work and knob and tube work in each case, and the figures represent actual cost to the customer.

COMPARATIVE COSTS PER OUTLET.

	No. outlets.	Knob and Tube—Total cost.	Knob and Tube—Cost per outlet.	Conduit—Total cost,	Conduit—Cost per outlet.
No. 1.....	120	$247.00	$2.06	$423.00	$3.53
No. 2.....	80	147.00	1.84	251.00	3.14
No. 3.....	72	158.00	2.19	248.00	3.44
No. 4.....	66	136.00	2.06	213.00	3.23
Average		.....	2.04	.....	3.36

Average excess cost of conduit work over knob and tube work. 65 per cent

A large number of the best-informed construction men and consulting engineers agree in the opinion that the only safe method of installing concealed wiring is to draw the wires into iron conduits, and it is believed that the day is surely coming when no other method will be recognized where any pretense is made of installing high-grade work.

Street Illumination at Newark, N. J.

BY WILLIAM H. STUART.

When the flaming arc lamps blazed out on South Broad Street, Newark, N. J., on Jan. 16, 1909, Newark stepped one pace ahead of every other city in the country in the point of street illumination. South Broad Street ranks now as the most brilliantly lighted thoroughfare in the country from street lamps alone. This street is also one of the widest thoroughfares in the country, being over 100 ft. from one sidewalk to the other.

The primary object was some advertising scheme to divert

FLAMING ARC LAMP STREET ILLUMINATION, NEWARK, N. J.

trade from the shopping district on Broad Street, north of Market Street, to that portion of the street south of Market Street. After considerable talk the merchants of the district organized an association known as the South Broad Street Improvement Association. A committee conferred with the officials of the Public Service Corporation of New Jersey, which concern operates the lighting business in Newark, as to means and costs of doing the advertising by electric light, and they also offered to place as many electric lights in their windows and store fronts as was possible. For this lighting they asked for a reduction in rates, expecting to use it from dusk until midnight every evening in the week. The Public Service Corporation could not see its way clear to granting the merchants any special rates, but on the other hand submitted a general street lighting proposition which was readily accepted.

A system was laid out composed of flaming arc lamps to remain as a permanent installation and a system composed of incandescent lamps to be used temporarily for two weeks only—the idea being to open the electric display in a blaze at a given time and have as attractive and brilliant a one as possible. The affair was widely advertised in the newspapers and by means of special posters, etc., throughout the entire city. The main point brought out in the advertising was the fact that nowhere else on earth was there to be found such a display of permanent electric street illumination. As the hour approached when the current was to be thrown on, an immense throng of people jammed the streets, who came out in a raging snowstorm to witness the scene.

The permanent installation is composed of 35 flaming arc lamps, made by the Scott Electric Company, of Newark, with a rating of 10,000 cp for each lamp. These lamps were erected on poles along three blocks of South Broad Street at a distance of every 60 ft., and replaced 21 of the regular enclosed alternating-current, arc-type of street lamp. The new installation has been erected on a three-year contract. The lamps are lighted at dusk and burn till dawn. The charge which the Public Service Corporation makes the merchants for this installation is a very favorable one. The city makes an allowance to the merchants amounting to that which was paid to the Public Service Corporation for the use of the old enclosed street lamps.

To add further to this installation, thousands of incandescent lamps were strung across the street and along the streets from the top of the lamp poles. These lamps were furnished free, together with the current for lighting them by the Public Service Corporation. The buildings facing South Broad Street were festooned with varied colored lamps and draped with flags and bunting. This incandescent lighting will be left up for two weeks, the flaming arcs remaining as street lamps.

The merchants when they first learned of the flaming arc proposition immediately started a subscription list to pay for the installation and all were invited to contribute. Not only did those benefiting directly respond with enthusiasm, but business houses in other sections of the city and private citizens who believe in civic pride also joined. The sums so contributed ranged from $5 to $500.

That the whole scheme has been a big success is already proved by the results. Already plans have been made to extend the lighting two more blocks with an additional equipment of 15 flaming arc lamps, making 50 lamps in all. The success of the affair has so impressed the merchants from whose territory the scheme was intended to divert business, that they are making plans to counteract the effect.

The Public Service Corporation believes that it has struck a very good proposition and is receiving numerous calls for installations of flaming arcs all over its territory. The free advertising that was derived from the affair exceeded everything obtained by any and all other methods employed by the company, and the central-station service in Newark received a great boom from the display.

New Telephone Patents.

NEW APPARATUS.

A combined drop and jack forms the subject of a patent granted to Mr. T. Lidberg, of Chicago, and assigned by him to the Swedish-American Telephone Company. The novelty lies in the removable coil of the drop part. The magnetic coil casing is closed at the rear by the drop armature. It is open at the front. The coil and core are assembled integrally with the drop face and shutter and the whole may be slipped into place from the front, the coil terminals automatically engaging spring clamps.

Mr. E. S. McLarn, of New York City, has patented a new short-arm type bracket for transmitters for the small type wall set. A hole is made in the cover of the box and from a face escutcheon plate mounted upon this there projects inwardly two triangular stiffened sheet-metal wings. The ordinary transmitter lug is thrust between the wings, being engaged by flat bosses raised on the opposing faces of the wings, and being centered by small bosses which fit the drilling of the lug. The whole is then adjusted for tension by a bolt through the rear point of the wings. This patent has been assigned to the Western Electric Company.

PARTY-LINE SETS.

One type of multi-party line now becoming prevalent is the despatch circuit of railroads, either electrical or steam. With such a circuit there is distributed at more or less equal inter-

vals a number of talking stations, any two of which, or any combination of which, may be used simultaneously. When a large number of stations is used, the line resistance differs to such an extent that there is an uneven distribution of the telephone currents; the near stations get more than their share and some of the far stations do not receive enough.

Mr. H. D. Currier, of Chicago, has devised a means for overcoming this difficulty in the shape of an adjustable inductance coil wired in the telephone set at the station. All stations are bridged, and when many are to be used together the inductance at those receiving insufficient current is decreased by withdrawing the sliding core. Each station, of course, is adjusted for maximum practicable inductance. Mr. Currier has patented the use of such an adjustable inductance for this purpose. In his specification he also suggests a detachable shunt about the receiver circuit which can be controlled by the manipulation of a key. This shunt, of course, removes from the transmitting station the inductance of its own receiver.

A four-party line, selective-ringing circuit forms the subject of a patent granted to Mr. H. G. Webster, of Chicago, and assigned to Mr. M. G. Kellogg. Two of the stations are provided with ordinary biased selective bells, both wired to the same limb of the line. One of these responds to negative impulses and the other to positive impulses. At the other two stations alternating-current bells are used, these being wired to the second limb of the line at both stations, but the circuits of both are carried through the contacts of polarized direct-current relays located at the respective stations. The coils of these polarized relays are both wired to the first limb of the line, and they, together with the bells, at both stations are connected to ground on their free sides.

The operation of the system is as follows: The pulsating currents of proper polarity applied to one side only affect the correspondingly poled pulsating bells. At this time, of course, the alternating-current bells fail as no current is applied to their side of the line. When current is, however, applied for the alternating-current bells, the differentiation between these two is effected by applying properly poled steady current to the other side of the line simultaneously. The pulsating bells fail on this steady current. The polarized relay, on the other hand, at the desired station closes the circuit of the alternating-current bell, under the influence of the particular sign of steady current applied, while the second polarized relay opens its bell contact under the influence of this same current.

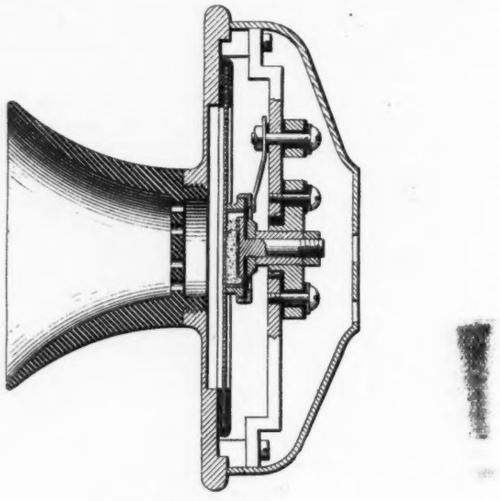
A third four-party line system has been patented by Mr. W. W. Dean, the patent being assigned to the Kellogg Switchboard & Supply Company. This system contemplates the use of the ordinary biased polarized bell responding to either positive or negative impulses and two stations legged off each side of the line to ground. With the common-battery system, it becomes necessary to maintain this grounded bell leg open to steady current in order to prevent the display of the line signals. Mr. Dean's system provides for maintaining this condition by the introduction in the bell circuit at each station of the proper number of electrolytic cells. The electrolytic cells are poled to oppose the flow of current from the exchange storage battery, yet they freely permit the passage of intermittent direct currents.

SWITCHBOARD CIRCUIT SYSTEMS.

An improvement in automatic switchboard circuits has been invented jointly by Messrs. A. H. Dyson and F. W. Dunbar. The improvement consists in the substitution of a differential repeating-coil relay for the usual knock-down relay. Hence this repeating-coil relay serves not only as the means of current supply to the two branches of a connection built up through the automatic switchboard, and as the repeating connection between the two branches of this circuit, but it also serves, through its contacts, to control the restoration of the apparatus upon the completion of the connection. This restoration follows the simultaneous grounding of the two limbs at either end of the connection. The repeating relay is balanced differentially until such a ground is applied, when its windings become unbalanced to effect the desired disconnection.

TRANSMITTER.

Below is shown an improved transmitter, the invention of Mr. W. W. Dean, of Elyria, Ohio. This instrument is primarily of the inverted, solid-back type, the usual auxiliary mica diaphragm being provided, with the carbon cup clamped to its periphery and the stationary electrode clamped to its center. One end of the carbon cup is, however, omitted, this end being closed directly by the diaphragm. The rear of the diaphragm is properly plated to serve as an electrode. The tension springs,



DEAN TRANSMITTER.

one of which is shown, hold the carbon cup sufficiently tight against the rear of the diaphragm to seal it, there being no other connection between the cup and the diaphragm. One of the chief improvements claimed lies in the symmetrical application of the pressure of the damping (and clamping) springs to the diaphragm through the cylindrical carbon cup. Mr. Dean's patent has been assigned to the Dean Electric Company.

Letter to the Editors.

The United States Patent System.

To the Editors of Electrical World:

Sirs:—The account in your issue of last week of the discussion of the U. S. patent system at the Chemists' Club and associated societies, as well as the notice concerning the Court of Patent Appeals measure now before Congress, indicate clearly the error of the proposed methods to correct patent abuses, and the effort expended in their advocacy are misdirected and cannot lead to the desired results.

The remedies suggested by these writers are presented too early in the game. Who is there to listen to them; who to execute their ideas? The Commissioner of Patents is not empowered to make any of the proposed changes and Congress can act only on bills brought before the House, such as the bill of the American Bar Association. Congressional committees cannot or *should* not take cognizance of individual suggestions, because in most instances they are one-sided. They should not even pass a measure of a single class of men such as form the American Bar Association without hearing inventors and manufacturers and others of standing interested in the cause, because that association cannot judge for these.

What is needed by the commerce of the United States and by the manufacturing interests is a standing representative committee, perhaps attached to the Department of Commerce and Labor. It should consist of independent inventors and others interested in the industries concerned, who should be able to discuss and urge the passage of proper measures before Con-

gress in a less round-about way than is possible at present. Any other way will merely be a case of from the frying pan into the fire.

The laws at present are not up to date and competency of the courts does not exist when any of the sciences are involved in a suit. The American Bar Association wishes to give the inventor a final chance to get justice if he cannot obtain this in the lower courts, by creating the Court of Patent Appeals. Will it help? Let us see. There are to be chosen five justices on their legal qualifications, and our present system of court procedure is to be retained. But perhaps 95 per cent of the inventors and 80 per cent of the manufacturers are unable to uphold their present rights through the lower courts against commercial aggression, and, therefore, could not reach this tribunal of final resort if it existed. Concerns with large capital that can take their suits through the lower courts and could make such an appeal, compromise out of court if possible, buy out the competitor or pool patent interests, to avoid additional legal expenses. However, if this were not so, could these five judges be more just than those of the lower courts? Can they cover the field of knowledge necessary for rendering proper judgment? No, they cannot. There would be created a titled judiciary with plenty of dignity, drawing large salaries but incapable of performing the work required.

What the industries need is action by national and other engineering and industrial societies, which will unite in suggesting the enactment of proper laws and authorization of proper tribunals, and have at Washington a representative committee to advocate the measures proposed.

What is actually needed to meet the present situation is a single court of original jurisdiction which may convene in different sections of the country, and a single Court of Appeals. A government grant of privileges of national scope, such as a patent, should be heard before a Court of National Jurisdiction. Instead of a Court of Appeals, as planned by the American Bar Association, where the people would pay a tribute to titled men instead of for services rendered, the judges should include men not only versed in law but also in the state of the art, who have worked in the Patent Office Division in which a patent has been examined. Every industry should have the same right to a competent judiciary.

This change from the present mode cannot be accomplished at once; the solution for the intermediate steps is, however, not difficult to find or to accomplish.

The irony of leaving to others what you yourself should attend to is plainly apparent. The people are exasperated by "too much court," "too little justice," "too great expense." They want competency in the courts and adequate laws. The generous American Bar Association (always ready and willing to help the poor inventor) answers: What you need are courts and more courts.

ST. LOUIS, MO. LUDWIG GUTMANN.

DIGEST OF CURRENT ELECTRICAL LITERATURE

Abstracts of the important articles appearing in the electrical periodical press of the world

Generators, Motors and Transformers.

Reluctance of Air-Gap.—F. C. BAILLIE.—The author quotes some experiments verifying the formula of Carter for the effect of armature slots on the reluctance of the air-gap of a dynamo (see *Electrical World*, Vol. 38, page 884). Carter's formula is, however, not convenient for quick applications, but the present author has employed it to plot a diagram from which the correction coefficient can be read off directly. This is reproduced in Fig. 1. In constructing this diagram from Carter's formula, the scales of ordinates and abscissas have been graduated so as to make all of the curves come out straight lines. This arrangement has the advantages of lending itself to accurate construction and of being readily copied on tracing paper. —Lond. *Electrician*, Jan. 8.

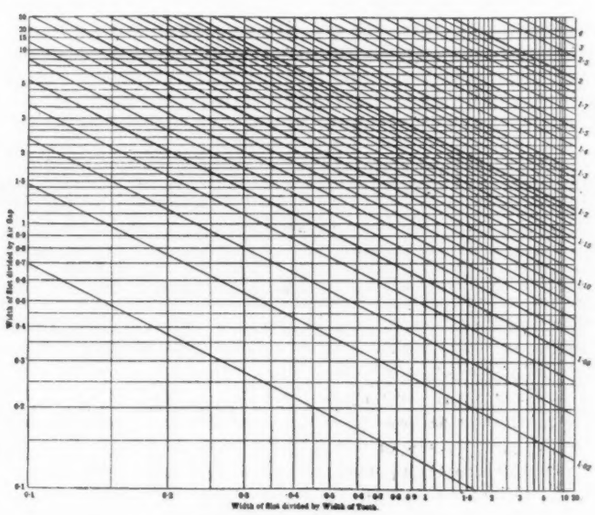


FIG. 1.—DIAGRAM OF CORRECTION COEFFICIENTS.

Copper and Iron in Generators.—A. G. ELLIS.—An article illustrated by diagrams in which the relative costs of copper and iron in alternating-current and continuous-current generators are considered. It is shown that, whereas the copper costs constitute some 55 per cent of the total cost of effective material in the case of continuous-current designs, this figure falls to less than 35 per cent in the case of alternating-current designs. The preponderance of copper in the former case is explained as being due to commutation restrictions. The effect of these considerations on the relative weights and costs of alternating-current and continuous-current generators for various ranges of speed and output is then shown by a number of curves, and finally there are given some curves which show that at high speeds continuous-current machines weigh less but cost more per kilowatt than alternating-current machines.—Lond. *Elec. Eng'ing*, Jan. 7.

Automatic Voltage Regulation of Direct-Current Generators. —A note on a recent British patent (4372, 1908) of the Felten & Guilleaume Lahmeyerwerke A. G. Compounded continuous-current generators, when working in parallel, have the disadvantage that fluctuations of the e.m.f. in the circuit produce considerable variations in the currents through the machines. According to the present invention, this unstable state is utilized to obtain an automatic voltage regulation, in that the equalizing currents between a machine to be regulated and a compounded machine in parallel with it are caused to influence the magnetic circuits of both machines. An over-compounded machine is put in parallel with the shunt-wound generator, the voltage of which is to be regulated, and auxiliary exciting windings on the magnet-poles of the shunt generator are connected in series with the compounded machine. The circulating current will thus raise the e.m.fs. of both machines, and by suitably adjusting the number of turns in the two series windings, the pressure of the shunt dynamo can be made to keep constant over wide variations in load. The main generator may be excited separately by a compounded machine which is in parallel with the main machine. If the latter is an alternator, a suitable converter must be interposed between the two machines.—Lond. *Elec. Eng'ing*, Jan. 7.

Single-Phase Commutator Motor.—B. G. LAMME.—An article discussing the characteristics of the single-phase commutator motor and the special features characteristic of its design and operation. The author deals especially with the necessity of reducing the excessive current handled by the brushes and

with the question of power factor. The explanations are given in a simple, clear way without mathematics.—*Elec. Jour.*, January.

Flux Density in Teeth.—F. Blanc.—A mathematical paper illustrated by diagrams, in which a graphical method is described for determining the real flux densities in the teeth of dynamo armatures. This method permits one in general to avoid the use of the so-called "apparent teeth induction." A numerical example is added in which the application of his method is shown to the calculation of the total magnetizing amp-turns and the losses due to reversal of magnetism.—*Elek. Zeit.*, Jan. 7.

Lamps and Lighting.

Street Lighting of Berlin.—L. Bloch.—The conclusion of his long illustrated article on recent developments in street lighting of Berlin and a comparison with former methods of illumination. The results are summarized as follows: Gas lighting by the adoption of inverted high-pressure lamps has made a considerable step toward obtaining a greater, and at the same time a more economical, illumination in the streets. In the same

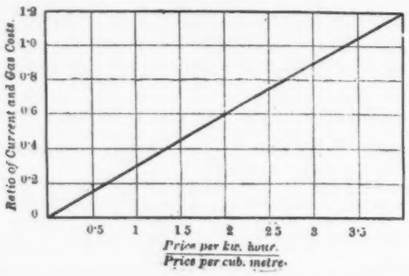


FIG. 2.—RELATION OF CURRENT AND GAS COSTS TO ILLUMINATION.

way, also, electric light by the practical use of flame arc lamps for street lighting, especially when "Alba" electrodes are employed, makes a very suitable and economical light for this purpose. It is as impossible to-day as heretofore to state which one of these two very different methods of lighting is the cheapest, but the balance lies with one or the other, according to the cost of gas, electricity and maintenance. Formerly the ordinary arc lamp was more efficient and gave a better distribution of light than the upturned gas lamp under ordinary or high pressure, and to-day the flame arc lamp, with "Alba" or other electrodes, holds the same position as regards inverted high-pressure gas lamps. In conclusion, the inverted high-pressure gas lamp and the flame arc lamp fitted with "Alba" or with inclined electrodes are compared. The comparison is not made with any particular prices for energy or gas, but is considered in a general manner, so that the prices for energy and gas can be inserted in any particular case. For lighting by inverted high-pressure gas lamps an average consumption of 20 liters per lux of mean horizontal illumination and 100 sq. m of street surface can be taken. The corresponding value for the lamp fitted with "Alba" electrodes or with inclined flame electrodes is about 6 watts. This value is obtained when the arc lamps are suspended at the usual height of 8 m or 9 m (26 ft. or 29 ft.). A comparison of these two values is shown in Fig. 2, from which it will be seen that with equal prices per kw-hour and per cubic meter of gas the cost of energy for the flame arc lamp is only 30 per cent of the cost of gas with inverted high-pressure gas lamps. The costs for energy and gas becomes equal when the price of energy per kw-hour is 3.3 times that of gas per cubic meter—for example, when gas costs 3 cents per cubic meter, or 84 cents per 1000 cu. ft., and a kw-hour costs 10 cents. It was formerly shown that using upturned high-pressure gas burners and ordinary direct-current arc lamps the cost of energy was 36 per cent of the cost of gas, so that the total costs were equal when the price of energy was 2.75 times that of gas. In spite of the great decrease in the consumption of gas lighting, that is, from 50 to 20 liters per lux and 100 sq. m, the advantages of electric lighting by flame arc lamps as compared with inverted high-pressure gas lamps are greater than they were with ordinary arc lamps and upturned high-pressure gas lamps.—Lond. *Electrician.* Jan. 8.

Tungsten Lamp.—A note on a recent British patent (19,311, 1908) of the Siemens & Halske Company for the manufacture of tungsten filaments. Nickel tungstate is mixed with tungstic acid or some plastic tungsten compound, so that after reduction by heating to a temperature of about 1650 deg. C. in an atmosphere of hydrogen, the final alloy contains about 12 per cent of nickel and 88 per cent of tungsten. This alloy of nickel and tungsten is ductile, and can be drawn or rolled. After the drawing the nickel is expelled by heating the filament electrically in a vacuum.—Lond. *Elec. Eng'ing*, Jan. 7.

Generation, Transmission and Distribution.

Power Companies in England.—An anonymous article in which the writer reviews the conditions under which British power companies are working. He points out that the companies have scattered districts owing to their not being allowed to enter the large municipal areas, and that there have been other causes to make the capital expenditure high. Taking an imaginary case of a company that has spent $3,000,000, and has 8000 kw installed in its power house, and generates 21,024,000 kw-hours per annum at a plant load factor of 40 per cent, he calculates that the capital cost and establishment charges per kw-hour sold will be 1.054 cents, and the works costs 0.5 cent, making a total of 1.554 cents per kw-hour, and in order to pay 5 per cent dividend the kw-hour must be sold at 2.408 cents, a price which would be prohibitive. In an editorial comment on this article it is not denied that British power companies have to earn dividends upon a capital that has been much inflated by the cost of parliamentary procedure and the difficulty of raising money at the outset; that they are prohibited from developing their business within the boundaries of the largest towns and cities in which municipal electricity works are in existence; and, lastly, that the exclusion of these areas increases the cost of the transmission and distributing lines, which have to be extended to the less populous parts of the companies' districts, so that a greater length of main is required per consumer. But the above specific figures are considered to be too pessimistic.—Lond. *Elec. Eng'ing*, Jan. 7.

Energy Supply from Central Stations.—A table of electric energy supply in which statistical data are given on the progress made by electricity departments of the principal industrial towns in England in the encouragement of the owners to employ electric motors for driving their machinery. Seventy British stations are covered in this list. With respect to the total brake horse-power connected, the Glasgow municipal station heads the list with a total of over 27,000 hp.—Supplement to Lond. *Electrician*, Jan. 8.

Swedish Power Company.—P. Frenell.—The first part of a long illustrated description of the Hemsjo Power Company, distributing energy in the southeastern part of Sweden, the principal towns being Kristianstad, Solvesborg, Karlshamm and Karlskrona. The amount of power which the Hemsjo company now has at its command is about 20,000 hp. Water power is utilized. A description is begun of the upper Hemsjo power station, which contains three three-phase generators, each giving 900 kva. The article is to be continued.—Lond. *Electrician*, Jan. 8.

High-Tension Energy Transmission in Europe.—A list of the 20 transmission systems in Europe on which the transmission e.m.f. is 30,000 volts or above. The highest voltage is to be used by the Sociedad Hydroelectrica Espanola Molinar, the system being in course of erection in Spain. The e.m.f. will be 66,000 volts, the rating 25,000 kw. Energy will be transmitted over a line 150 miles in length to Madrid.—Lond. *Electrician*, Jan. 8.

Sicily.—A note on recent hydro-electric developments in Sicily, taken from a paper of E. Vismara before the Italian Electrical Society. The Societa Elettrica della Sicilia Orientale were recently building two stations, one to have an 8000-hp equipment and the other 7500 hp, the transmisison line of 137 miles following the coast from Messina to Syracuse. Iron

poles were used, being placed about 200 yd. apart where the line is straight; each pole is 60 ft. high and weighs about ¾ ton. The line is made up of three wires each 0.24 in. in diameter, and the transmission e.m.f. is 40,000 volts. A 50,000-hp, 40,000-volt distribution system had been designed encircling the island. To build it, it will be necessary to use 790 tons of copper, the mean diameter of the wires being 0.28 in.—Lond. *Electrician*, Jan. 8.

Electric Cranes.—H. H. BROUGHTON.—A continuation of his long illustrated serial on electric cranes. In the present installment the author deals with the design and construction of the structural steel framework of cranes. The first sections of the article are devoted to the consideration of the most suitable materials and working stresses. It is suggested that the (Brit.) Engineering Standard Committee's specifications for structural steelwork should be adhered to by crane makers; also that the working stresses allowed be based on the nature of the forces acting and not upon some arbitrary "factor of safety." Then follows a note on the determination of the stresses in the several members of frames of complicated shape. To assist designers curves connecting weight and rating of English and German cranes are given. A number of typical examples of girder construction are also described.—Lond. *Electrician*, Jan. 8.

Winding in Mines.—A note on an electric winding plant in a German mine. There is installed in the power station a steam turbine provided with an automatic valve for by-passing live steam to the expansion stages. It drives two machines coupled in tandem. The first of these is a continuous-current generator, which provides the energy for the winding motor, and the second machine is a three-phase alternator supplying energy for auxiliary motors about the mine and surface works. The control of the winding motor, as in other winding systems, is accomplished by variations in the strength and direction of the generator field after the Ward Leonard principle. The peaks of the load are met by supplying high-pressure steam to the expansion stages of the turbine. No flywheel set is used.—Lond. *Elec. Eng'ing*, Jan. 7.

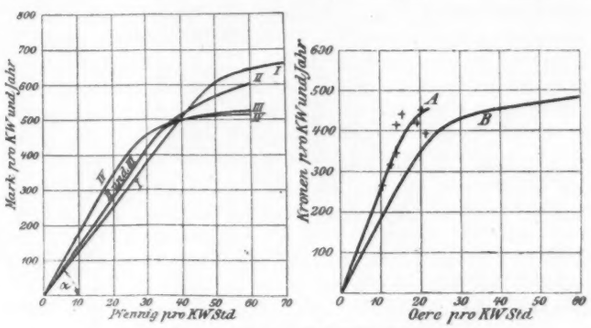
Traction.

One-Thousand-Two-Hundred-Volt Direct-Current Railway.—J. R. HEWETT.—An illustrated description of the Pittsburgh, Harmony, Butler & New Castle 1200-volt direct-current railway, which is 65 miles long and is constructed throughout for high-speed service. Energy is generated at Harmony Junction at 13,200 volts, 60 cycles, and fed to substations. Synchronous motor-generator sets in the substations transform the high-potential alternating current to 1200 volts direct current, which is supplied to the trolley.—*Elec. Railway Jour.*, Jan. 16.

Electric Motors in Railroad Shops.—J. LISTON.—The author discusses the advantages of the electric drive in railroad shops, especially the increased output, the saving in fuel and labor, the reduction in the size of the power plant, the unhampered location of machinery, the reduction of maintenance cost and of cost of building, and the ability to economically operate a single machine overtime. While formerly direct current has been preferred in the electrification of railroad shops, this is hardly the proper policy. Three-fourths of the total power is used for constant-speed machinery and for this purpose the induction motor is most suitable. The author recommends alternating-current generators, together with motor-generator sets to supply direct current for the variable-speed motors in the boiler shop, etc.—*Gen. Elec. Rev.*, January.

Installations, Systems and Appliances.

Effect of Tariff on Financial Results of Central Stations.—NORBERG-SCHULZ.—A paper illustrated by diagrams, in which, on the basis of the reports of various central stations, an investigation is made as to the manner in which the yearly receipts per kilowatt of maximum load depend on the average receipts per kw-hour sold. It is shown that the kind of tariff, and especially the absolute value of the average price of the kw-hour, has a considerable effect on the receipts per kilowatt of maximum load. If in a central station the price per kw-hour sold is gradually reduced in the course of years, the receipts per kilowatt of maximum load also change, and this variation may be plotted in form of a curve. This curve has a similar form for stations working under similar conditions. It is called by the author the "characteristic curve" of the station. The characteristic curves for four different stations are shown in Fig. 3. Curve I refers to Breslau in Germany, curve II to Hanover in Germany, curve III to Copenhagen in Denmark, and curve IV to Kristiania in Norway. The abscissas represent pfennig per kw-hour (4 pfennig equal about 1 cent). The ordinates represent marks per kilowatt of maximum load per year (one mark equals 25 cents). The tangent of the angle, which the curve at any point forms with the axis of abscissas, is the load factor. When the rate of charging for electrical energy is reduced the load factor is increased so long as one deals with the upper range of the characteristic curve. When the rate of charging is further reduced, the load factor tends to remain constant = tan α, in Fig. 3. Electric stations must endeavor to have such rates of charging that they are on a lower branch of their characteristic curves. By changing the nature of



FIGS. 3 AND 4.—STATION CURVES.

supply, for instance, by adding a tramway load, the characteristic curve is changed. This result is shown in Fig. 4, in which *B* is the characteristic curve for lamp and motor supply alone, while *A* is the characteristic curve after a tramway load had been added. The abscissas are in this case oere per kw-hour sold, the ordinates are kronen per kilowatt of maximum load per year ($1 = 3.73 kronen = 4.0 oere).—*Elek. Zeit.*, Jan. 7.

Control of Motors.—D. E. CARPENTER.—An illustrated article on the automatic control of direct-current motors in industrial service. The lag in the operation of the switches, which governs the rate of acceleration of the motor, is controlled by either of two methods: partly by the varying drop of voltage in the starting rheostat, and, secondly, by means of a series accelerating relay switch. The method of controlling the rate of acceleration by drop in resistance is simple, effective and perfectly satisfactory where the voltage of the supply circuit is fairly steady. Acceleration by time element of the switches alone is useful where very quick starting is required, as in some operations in steel mills and rolling mills. Acceleration by series relay is essential where the line voltage fluctuates; by this method very close results can be obtained. The author also discusses safety devices, magnet switches and protective relay switches.—*Elec. Jour.*, January.

Brussels.—A. OSCHINSKY.—The first part of an illustrated description of a new electric station in the city of Brussels. There were formerly various generating stations in the city itself, but recently one generating plant has been erected outside of the city at a place favorably located for coal and water supply. This plant contains three 4000-hp steam-driven generators and a fourth generator rated at 2000 hp. This station generates high-tension energy, which is transmitted to five substations in the city, which distribute it by means of 2 × 110-volt, three-wire, direct-current network. In the present instalment the steam plant of the generating station is described. —*Elek. Zeit.*, Jan. 7.

The Earth as Conductor.—E. BRYLINSKI.—His report in full to the International Electric Congress at Marseilles on the possibility of using the earth as conductor, as part of a commer-

cial electric transmission system. The report is distinctly favorable. The same issue contains also an editorial note by J. Blondin on this subject.—*La Revue Elec.*, Dec. 15.

Electrophysics and Magnetism.

Dielectric Losses.—C. Kinsley.—An abstract of an American Physical Society paper on the dielectric losses in alternating-current circuits. The equations showing the distribution of energy in simple alternating-current circuits must contain terms giving the copper, eddy-current, iron-core and dielectric losses. The importance of the iron-core loss has been recognized and its amount carefully determined for the conditions usually met in practice. The dielectric loss, however, although recognized, has generally been found to be either negligible or assumed to be so without any actual determination. The present author found that frequently the dielectric loss is very large and it may be even larger than all of the other losses in the circuit. The dielectric loss is a function of the temperature, and the paper gives determinations for temperatures between —140 deg. C. and +50 deg. C. Various dielectrics have been examined; whenever they show absorption the energy losses are considerable.—*Phys. Rev.*, January.

Magnetic Properties of Electrolytic Iron.—E. M. Terry.—An abstract of an American Physical Society paper, giving an account of an experimental investigation of the effect of temperature on the magnetic properties of electrolytic iron. The iron for this work was furnished by Professor C. F. Burgess, and was 99.97 per cent pure. Rings were tested magnetically by a modification of the Rowland ring method. Hysteresis and magnetization curves were taken at temperatures ranging from —190 deg. C. to +780 deg. C. at intervals of from 20 deg. C. to 100 deg. C., for both freshly deposited and annealed samples. The energy loss per cycle and coercive force were found to decrease uniformly with increasing temperature, while the retentivity has a maximum at about room temperature. The permeability for low values of magnetizing force increases with the temperature, reaching a maximum of 9500 for $H = 0.5$, $T = 740$ deg. C. For larger values of H the permeability decreases with increasing temperature. One sample, after annealing, was found to have a coercive force of only 1.2.—*Phys. Rev.*, January.

Mechanical Strength and Conductivity.—N. F. Smith.—An abstract of an American Physical Society paper. The author has formerly given a preliminary report on the changes in the thermal and electrical conductivities of metal bars due to the influence of a stretching force. He has now completed these measurements with the following results. In all cases the thermal conductivity of the bars increases when a moderate tension is applied. As the limit of elasticity is approached the increase reaches a maximum. When the tension exceeds this limit, the conductivity remains practically constant in the case of steel and brass or begins to diminish in the case of iron and copper. The total change in thermal conductivity due to tension amounts to from 2 to 8 per cent. The corresponding changes in electrical conductivity are much smaller, and in each case the electrical conductivity is diminished under tension. The same experimental method has been applied to investigate the effects produced by torsion. These measurements are still incomplete, but have been carried far enough to show that the thermal conductivity, like the electrical, is diminished by torsion and that the changes in thermal conductivity are much greater in magnitude.—*Phys. Rev.*, January.

Electric Oscillations.—E. T. Jones.—A highly mathematical paper on electric oscillations in coupled circuits. In a system consisting of two circuits containing capacity, self-inductance and sufficiently great mutual inductance, each circuit has two natural periods of electrical oscillation. The problem of determining the constants of the two oscillations has been considered by Overbeck, M. Wien and Drude. Drude showed that in addition to having different periods, the two oscillations also have, in general, different damping coefficients, and calculated their values; he further showed how to calculate the potential at the terminals of the secondary circuit at any time after the application of a given potential-difference to the primary terminals. The present paper deals mainly with the case in which the oscillations are started by breaking a circuit in the primary. The expression for the secondary potential is deduced for this case by Drude's method, and compared with measurements of photographs obtained by means of the short-period electrometer (or "electrostatic oscillograph," as it has been called), described by the present author. The instrument shows that the course of the variation of the secondary potential is much simpler when the oscillations are started in this way, owing to the absence of disturbance by the auxiliary sparking apparatus. Some photographs and their measurements are also given for electrical oscillations in coupled circuits produced by the "musical-arc" method.—*Phil. Mag.*, January.

Impulsive Motion of an Electric Sphere.—G. F. C. Searle.—The author has formerly calculated the energy and momentum radiated when the velocity of a charged sphere is impulsively changed by an infinitesimal amount, the change of velocity making any angle with the initial velocity. In the present paper he completes the investigation by calculating the energy and momentum which are radiated when the velocity of the sphere is impulsively changed in any manner, the only restrictions being that both the initial and the final velocities are less than that of light and that the sphere has no angular velocity about any axis through its center.—*Phil. Mag.*, January.

Aging of Steel.—An abstract of a report of C. E Stromeyer, chief engineer of the Manchester Steam Users' Association. The best Lowmoor furnace plates have, after years of work, acquired a brittleness which cannot be removed by annealing. The cause of this brittleness may be either a molecular change due to age alone, or a chemical change due to absorption of gases. A very small percentage of hydrogen makes mild steel not only brittle, but so hard that it will scratch glass, and very small traces of nitrogen also impart brittleness to mild steel. Stromeyer's conclusions with regard to the aging of steel are that the effect of an injury, such as a chisel nick, or a serious deforming pressure, is not an immediate one, except as regards local alteration of shape, but that after a lapse of many weeks the neighborhood of the injured region gets somewhat brittle. Nevertheless, this decrease of ductility is not serious, and has only been detected by very sensitive tests. In regard to steam-pipe explosions, it is shown that steam pipes made of mild steel are infinitely safer than cast-iron ones.—Lond. *Electrician*, Jan. 1.

Beta Rays.—V. E. Pound, W. Makower and N. Campbell.—Three papers on experimental investigations with respect to beta rays. The paper of Pound deals with the absorption of the different types of beta rays, together with a study of the secondary rays excited by them. The paper of Makower deals with the number and absorption by matter of the beta particles emitted by radium. His results indicate that the beta rays are stopped and not merely scattered when they pass through matter. The number of beta particles emitted per second by the radium *C* in radioactive equilibrium with 1 gram of radium is 5.0×10^{10}. The paper by Campbell deals with the absorption of the beta rays of uranium in liquids, especially in solutions. He finds that it is doubtful whether liquids possess a true absorption coefficient defined as a quantity occurring in an exponential equation.—*Phil. Mag.*, January.

Photoactive Cells.—P. Hodge.—A paper giving an account of an experimental investigation of photoactive cells with fluorescent electrolytes. No effect is produced by light upon the conductivity of a fluorescent solution unless a region very near the electrodes is illuminated and, further, this effect at the electrodes is produced only in a very thin film of the liquid immediately in contact with the surface of the plates. The author then studied the effects at the anode and especially at the cathode. While no conclusive results have yet been obtained he thinks he will be able to prove a definite connection between the photoelectric effects in fluorescent liquids and the phenomenon of fluorescence itself.—*Phys. Rev.*, January.

Gravitation.—C. V. Burton.—A highly theoretical paper in which the author endeavors to find a new dynamical basis for the theory of gravitation. His theory is a development of that

of Hicks. Reference to electric phenomena is also made.—*Phil. Mag.*, January.

Units, Measurements and Instruments.

Ampere-Hour Meters.—A. SCHWARTZ.—With revolving ampere-hour meters the difficulty has been experienced that the meter changes its constant after a short time of service and that considerable errors result, especially at low loads. This phenomenon is due to a transition resistance between brush and commutator. Stronger currents are able to break this transition resistance down, while at low load the resistance makes itself manifest. One method to compensate the errors is illustrated in Fig. 5. S is the shunt in the main-current circuit, W_1 is a resistance inserted in the circuit containing the brushes B_1 and B_1. A second set of brushes, B_2 and B_2, is short-circuited by means of the resistance W_2. If a transition resistance develops at the commutator, it affects not only the brushes B_1, but also the brushes B_2. By proper choice of the various resistances it is possible to obtain almost perfect compensation. The disadvantage of this arrangement is a high watt consumption. It has been found that the troubles due to this transition resistance can be overcome by providing systematic vibrations of the brushes. A device of this kind was recently described in the Digest. It has also been found that meters in which the

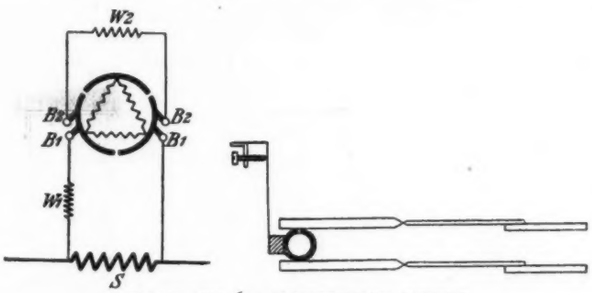


FIG. 5 AND 6.—AMPERE-HOUR METERS.

pressure of the brushes upon the commutator is sufficiently strong and in which gold is used in the commutator or in the brushes are subject to errors only after a long time. The gold prevents the occurrence of a transition resistance due to chemical action. Any transition resistance due to dust deposited, etc., can best be avoided by an automatic cleaning device. The author uses a third brush of hard graphite, which does not carry any current, but is intended simply to polish the surface of the commutator. An arrangement of this kind is shown in Fig. 6.—*Elek. Zeit.*, Jan. 7.

Measuring Alternating Currents.—C. KINSLEY AND E. J. MOORE.—An abstract of an American Physical Society paper, describing a method for determining small variations in an alternating current in a circuit. A short heating wire of iron, manganin or other material is used to carry the current, and about this is wrapped an insulated No. 40 copper wire. The wires are mounted in a glass tube, from which the air is exhausted. The short wire carrying the current heats the wire which is wrapped around it, and this wire is made one of the arms of a Wheatstone bridge. Either the galvanometer can be arranged to read the current directly upon a properly divided scale or else a direct current can be sent through the wire of such a value that the heating effect is the same as that due to the alternating current. The direct current can then be read with any of the usual direct-current instruments.—*Phys. Rev.*, January.

Telegraphy, Telephony and Signals.

Morse Key.—An illustrated description of some recent improvements in the well-known signaling key for submarine cable working and in the Morse key. The new design (Fig. 7)

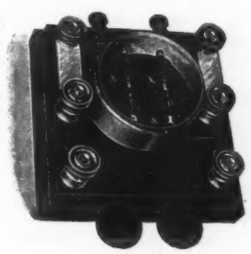


FIG. 7.—IMPROVED MORSE KEY.

was exhibited at the recent exhibition of the Physical Society in London. The levers are L-shaped, with the result that the contacts become horizontal instead of vertical, as in the standard forms. In this way they are always in view, so that there is greater likelihood of their being kept clean and in good working order, while, when cleaning is necessary, it can be performed with greater ease.—Lond. *Elec.*, Jan. 8.

Continuous Oscillations.—F. KIEBITZ.—A paper read before the Berlin Electrical Society describing a number of lecture experiments made with the aid of high-frequency continuous oscillations, and showing especially the characteristic resonance phenomena.—*Elek. Zeit.*, Jan. 7.

Miscellaneous.

Germany.—W. KOCH.—A review of the electrical industry in Germany, and especially of the large electrical manufacturing companies. The German electrical industry employed, in 1906, about 140,000 persons, who produced goods worth nearly $175,000,000, while $500,000,000 is invested in central stations and electric railways. The exports amount to $33,000,000 strictly electrical products, which is about 25 per cent of the whole production. The imports were $1,800,000, or 6 per cent of the export.—*Elec. Jour.*, January.

NEW APPARATUS AND APPLIANCES

Remote Control of Lamps and Motors.

BY G. E. PALMER.

A convenient method of control for lamps and motors, particularly when the latter are operated by alternating current, almost invariably results in an increase in the economy and safety of their operation. Now that the development of the art of remote control has produced a magnetically operated switch that meets all of the requirements of severe service conditions many modern buildings and residences are being equipped with such a system.

In a modern type of remote-control switch the contacts are made by means of laminated copper brushes; years of experience with circuit-breakers having shown that the knife-blade and carbon-block contacts were entirely unsuited for this class of work. This switch is closed and locked securely home by means of an armature-controlled toggle mechanism, this armature being in common relation with two solenoids, one of which closes and the other opens the switch. As the switch is held at both closed and open position by mechanical means, it is not necessary that the solenoids be energized except at the moment of operation, so means are provided automatically to break the operating circuit the instant the switch is fully closed or open.

The switch itself is controlled by a momentary-contact switch having the standard dimensions for flush push-button switches,

and is arranged so that by pressing one button the closing solenoid of the remote-control switch is energized, and by pushing the other button the opening coil is caused to operate. Each button operates an independent member in the switch, which makes a snap contact when the button is released. The buttons interlock so that they cannot both be pressed together, making a switch that not only performs its service admirably, but

Fig. 4 indicates a house-wiring plan in which the remote-control switch is controlled by the push button located at *B*. This arrangement permits control of any or all lamps in a building, making it possible to disconnect entirely the electric service in time of storms, while at the same time giving complete control of all lamps in the building. This arrangement can, if desired, be connected with the regular burglar alarm system so that a

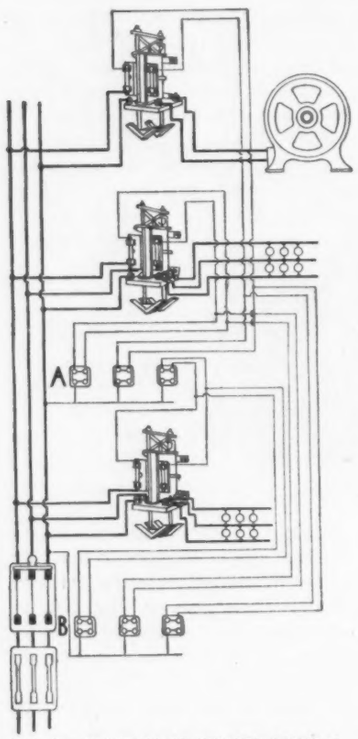


FIG. 1.—DIAGRAM OF REMOTE CONTROL CONNECTIONS.

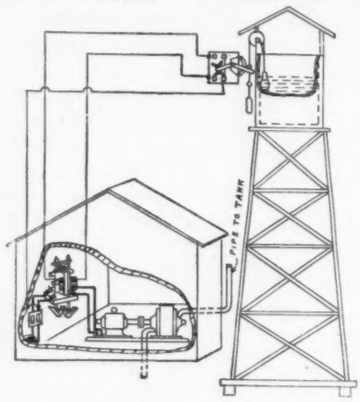


FIG. 2.—REMOTE CONTROL FOR WATER TANK MOTOR.

FIG. 4.—HOUSE WIRING PLAN.

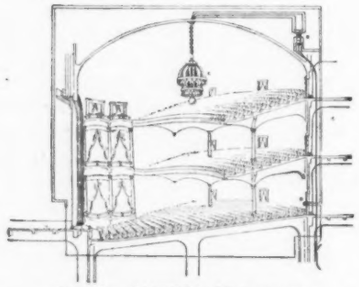


FIG. 3.—CONTROL OF THEATRE LAMPS.

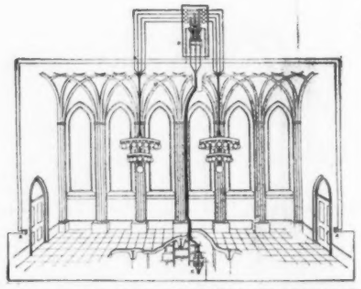


FIG. 5.—CHURCH CIRCUITS CONTROLLED REMOTELY.

meets the full approval of all inspection departments, a statement that also applies to the remote-control switch.

It will be observed by tracing the connections in Fig. 1 that either the group of lamps or motors may be controlled from either of the points *A-B*, it being further noted that the heavy mains are carried direct to the distributing points.

Fig. 2 shows the remote-control switch arranged for the control of motors driving pumps that supply elevated or compression tanks. The former is controlled by means of a float switch, and the latter by a pressure gage. Both of these control circuits are further controlled by means of standard three- or four-way switches, making the system at once comprehensive and complete. Fig. 3 shows a theater section. The complicated wiring systems in the modern theater may be greatly simplified by the use of remote-control switches.

The above is an illustration of a method of control from both stage and head usher's stand or box office of the principal means of illumination. It is one of the many adaptations possible in applying the use of remote-control switches to the wiring of buildings of this character. It is possible so to arrange a system of theater wiring as greatly to simplify the cumbersome stage switchboard, giving a better control of lamps and frequently making a very considerable saving in the cost of wiring.

Fig. 5 is a sectional view of a church. The panel board indicated at *D* is equipped with a remote-control switch, supplying chandelier circuits, and is controlled by flush push buttons located at *A* and *B*. This arrangement obviates the necessity of running heavy mains to convenient switching points, which are frequently very difficult to obtain in buildings of this character. It will be noted that the heavy mains are carried in a direct line from the service entrance *C* to the panel board *D*, the latter being located with the reference only to its accessibility and the natural center of distribution.

certain group of lamps can be switched on in event of the burglar alarm operating.

In fact, the use of remote-control switches imparts flexibility to the use of electricity not possible by direct methods of control.

Annual Show of the Association of Licensed Automobile Manufacturers.

The annual show of the Association of Licensed Automobile Manufacturers was held in Madison Square Garden, New York, Jan. 16 to 23, and the following statistics may give some idea of the size of the exhibition:

Complete gasoline cars	117
Complete gasoline car chassis	28
Complete electric cars	37
Complete electric chassis	5
Complete commercial cars	19
Complete commercial chassis	5
Taxicabs	3

The gasoline vehicles occupied the arena of the Garden, the overflow being placed on the galleries; while the electric pleasure vehicles, with one exception, occupied the space usually allotted to the restaurant near the main entrance. The electric commercial vehicles were located in the basement. Over 85 per cent of the gasoline vehicles on exhibition employ the jump spark for ignition; less than 15 per cent of the cars using the make-and-break. For the jump spark most of the machines use a high-tension magneto in connection with a storage battery for reserve, although there are very many cars using dry cells for this purpose.

Although the number of companies manufacturing electric vehicles does not seem to have increased, the vehicle itself is

evidently growing in popularity. The distance a vehicle will travel on a single charge under most favorable conditions is claimed to be over 100 miles; but with the increase in the number of charging stations the question of mileage decreases in importance. The features of the various designs of electric vehicles shown are contained in the brief descriptions which follow:

The Anderson Carriage Company, of Detroit, Mich., exhibited a roadster, a victoria and two coupés. An Elwell-Parker motor, rated at from 2 hp to 3 hp, is used and the power transmitted to a countershaft through a chain drive running in oil. The countershaft on which is fitted the differential gearing is fitted with ball bearings. The battery consists of 24 cells divided into two units of 12 cells placed in the front and in the rear under detachable hoods. Double chain drive is used on the Detroit electrics.

S. R. Bailey & Company, Amesbury, Mass., showed two victoria phætons. The vehicles were equipped with 30 cells of Gould battery and a 60-volt motor. The battery is hung, by a three-point suspension, under the floor and is easily accessible. A silent chain connects the motor to a countershaft and double roller chain is used on the rear wheels. A D-shaped steering wheel is used and the steering column swings either way. The speed control lever is mounted on top of the wheel in much the same manner that the spark lever is mounted in most gasoline cars. The car has forward speeds from 5 to 20 miles per hour and two reverse speeds.

Baker Motor Vehicle Company, Cleveland, Ohio, had five cars and two chassis on exhibition. These included a roadster, a runabout, a victoria, two coupés and a commercial and lighter chassis. Exide battery and General Electric motor and controller are used on this company's cars. The motor is suspended near the center of the car and a single chain drive is employed. The latter feature embodies the advantages of quiet running, and remaining in alignment, the chain being in the center of the rear axles. The battery is always connected in series and is divided; part being placed in front and part in the rear so as to distribute the weight. The number of cells used varies from 24 to 30, depending on the car. A steering wheel is used on all vehicles except the victoria and coupé, which are equipped with levers. Ball bearings are used on all revolving parts of the Baker vehicles.

Babcock Electric Carriage Company, Buffalo, N. Y., displayed a new runabout, a roadster, a coupé, a victoria, a town car and a chassis. The runabout is built on the lines of a gasoline car and has a battery of 42 cells. Half of these are placed in the front end of the car. Double chain drive is used on all but the town car, which has a worm drive. The batteries are built by the company, as is also the controller. All the cars have wheel steering gear. Friction is reduced to a minimum by ball and roller bearings, and lightness and graceful outlines are features of this company's output.

The Champion Wagon Company, of Owego, N. Y., exhibited a 1000-lb. wagon for general express service. This has a single General Electric motor equipment driving a countershaft by silent chain and from these double roller chains connect with the rear wheels.

Electric Vehicle Company, of Hartford, Conn., builder of the Columbia electric cars, displayed a victoria-phæton and a brougham. General Electric motors and Exide batteries are used. The model for this year preserves the original outward design, but embodies four changes in the mechanism—an emergency brake, two extra cells of battery, ball bearings on all wheels and the rear axle construction is now of the floating type. The motor and all mechanical parts are attached direct to the body and the reduction gear and enclosed chain connect the motor to the differential gear on the driving axle, which runs in a tubular casing, with all working parts housed to exclude dirt. A steel helical pinion and bronze helical gear connects the motor to the countershaft and thence sprocket and chain gear connects to the live rear axle. Steering is accomplished by means of a hinged lever. The vehicles are provided with every approved device for promoting comfort.

General Vehicle Company, of New York, exhibited five of the seven sizes of commercial wagons built by it, in the basement; the smallest being a light delivery runabout with closed body, having a capacity of 350 lb. load, a speed of 14 miles per hour and a mileage of 50 on one charge of the battery. Standard models of electric delivery wagons of 1000 lb. and 2000 lb. capacity were shown complete and ready for work. These have a radius of 40 miles on a single charge and a speed of from 10 to 11 miles per hour. A heavy trucking wagon of 3½ tons capacity with a stake body was also shown. This model has a mileage of 35 and a speed of 7 miles per hour. A representative chassis of 2 tons capacity was featured. This type illustrated the general design of all models of the power-plant construction; the wagon having a radius of action of 40 miles at 8½ miles an hour. The battery which furnishes the electricity for the 85-volt motor is suspended below the main frame in a cradle. It is placed in sectional crates. The controller is of the continuous torque type, speed changes being effected without interrupting the supply of energy to the motor. The latter has its armature revolving in ball bearings. The motor is suspended on a cross-bar pivoted to the side frames in front of the rear axle. Double chain drive is used from a countershaft. The latter consists of two short shafts connected by a differential of the spur gear type; each shaft being connected to a rear wheel through sprockets and roller chain.

Rauch & Lang Carriage Company, of Cleveland, Ohio, featured a runabout, stanhope, coupé, extension coupé, gentleman's runabout and chassis. In these cars the battery is located at both ends. Ball bearings are used on the motor and on the countershaft, and transmission from the former to the latter is by means of a silent chain. The motor used is of the Herter Electric Company make and the batteries are of the General Storage Battery Company's Exide type. The controller is of the flat radial type, giving two starting and four running speeds.

Studebaker Automobile Company, of South Bend, Ind., exhibited an ambulance equipped with an Exide battery of 36 cells and Westinghouse motor and controller; an 11-passenger drag, equipped with 44 cells and two motors with chain drive; a stanhope fitted with divided battery of 24 cells, one-third in front, and a centrally-located motor with single chain drive; one runabout similar in equipment to the stanhope; a high-speed stanhope with single chain drive from motor in center and equipped with 12 cells in front and 24 cells in the rear. In the basement were shown four commercial vehicles consisting of one 5-ton, one 2500-lb., one 1500-lb. and one 800-lb. wagon. In these the batteries are always connected in series, the small delivery wagon having 26 cells and the others 44 cells. Although a manufacturer of gasoline cars, the company only builds commercial vehicles of the electric type, feeling that within the convenient radius of action of the electric it is the more economical of the two.

The Waverley Company, Indianapolis, Ind., showed five models, two coupés, a stanhope, a victoria and a runabout. The new driving system employed was shown in operation. The motor is attached to the body with rubber cushions to overcome vibration. The power is transmitted to the floating rear axle by a silent chain running in oil, a shaft parallel with the axle fitted with universal joints and a small herring-bone gear on the rear axle. The battery is located over the front and rear axles. The motors are of Waverley design and Exide, National or Waverley batteries are used.

Woods Motor Vehicle Company, Chicago, Ill., had two coupés, a victoria and a stanhope on exhibition in the gallery overlooking the main hall. In these cars the motor, transmission gears and driving sprockets are mounted on a bronze frame. On one end of the motor shaft is fastened a pinion meshing with a gear mounted on the differential housing. From each end of this differential power is transmitted through universal-joint shafts to the driving sprockets. From the sprockets chains run to the rear wheels. The main transmission gears are of the herring-bone-tooth type and the differential is of the beveled-gear type. A four-pole series-wound

motor is used and a drum controller. No less than 16 annular ball bearings are used throughout the car. Exide batteries are employed and the weight of these is distributed over the front and rear wheels.

Dinner to Electric Vehicle and Carriage Manufacturers.

Mr. Herbert Lloyd, president of the Electric Storage Battery Company; Mr. J. R. Williams, second vice-president; Mr. Charles Blizzard, third vice-president, and the sales managers of the company from all over the country gave a dinner to the visiting electric vehicle and carriage manufacturers at Sherry's, New York, on Wednesday evening, Jan. 20.

The dinner, while purely social, was notable for the prominence of the guests and in that it gathered together for the first time nearly all the representative vehicle manufacturers.

Among the guests were: Messrs. Haydon Eames, president, and Hanson Robinson, W. P. Kennedy, E. C. Witwer and A. R. Davis, of the Studebaker Company; Messrs. E. Greenfeldt, R. C. Norton and O. B. Henderson, of the Baker Electric Vehicle Company; Messrs. C. J. Metzger and Louis E. Burr, of the Woods Motor Vehicle Company; Messrs. Robt. McA. Lloyd and J. A. Smith, of the General Vehicle Company; Messrs. C. E. Firestone and R. A. Feul, of the Columbus Buggy Company; Mr. Chas. E. J. Lang, of Rauch & Lang; Messrs. W. B. Cooley, H. H. Rice, general manager, and W. C. Johnson, of the Waverly Electric Vehicle Company; Col. E. W. M. Bailey, of the Bailey Carriage Company; Mr. Geo. M. Bacon, of the Anderson Carriage Company, and Mr. J. E. Michel.

In addition to the general good fellowship the guests were regaled with an artistic and entertaining vaudeville show, interspersed with hits on the guests, their products and current auto topics.

Motor-Driven Lumber Mill.

A most progressive example of the new era in lumber-mill construction is that of the Dare Lumber Company, of Elizabeth City, N. C. This mill is located near the Norfolk & Southern Railroad, on the banks of the Pasquotank River. There is deep-water communication from its docks and mill pond to the Albemarle Sound, and the extensive system of inland waterways, of which the sound is a part. For its lumber supply the company draws upon all the timber of this celebrated yellow-pine district. The supply in sight is such that even with the old-time destructive methods of deforestation the mill could run for a long period of years, but the plans of the owners are to lumber their holdings scientifically and in this way maintain a perpetual supply of first-class timber for their mill.

The mill itself is constructed of reinforced concrete throughout. All the machinery is operated by means of electric drive. In the power house is installed a 500-kw, three-phase, 60-cycle, 150-r.p.m. Western Electric alternator direct-connected to a Clark Brothers semi-Corliss engine. This unit furnishes electricity not only for the lumber mill, but has sufficient reserve to take care of a lathe mill, planing mill and shook mill.

The mill itself is equipped with two 8-in. band-saws, each driven by a 100-hp, 440-r.p.m. induction motor. An 8-in. resaw is also installed, which is direct-coupled to a 150-hp, 385-r.p.m. induction motor. It has been found that these machines are of ample capacity to do their work and are most of the time running with less than normal load; while with the old system, where a steam engine was employed to drive these saws, it required more than 300 hp continuously to do the same work.

From the band-saws the lumber goes to two edgers. The shafts of these edgers run at 1730 r.p.m., and a 50-hp motor of this speed is mounted directly on the shaft of each. From the edgers the boards are carried to the automatic trimmer, to the shaft of which is coupled a 35-hp, 870-r.p.m. motor. The waste is carried to the slashers. The main shaft of this machine also is coupled directly to a 35-hp, 870-r.p.m. motor.

The lathe mill and shook mill get their supply from this point and the boards which cannot possibly be used will be carried to the Diamond hog, which is operated by an 85-hp, 1200-r.p.m. motor belted to the shaft of the hog. All the refuse emerges in the form of small chips, which are carried to the fuel house. All the conveyors, elevators, log hauls, loaders and unloaders throughout the mill are driven by 24 back-geared induction motors ranging in size from 7½ to 20 hp. All these

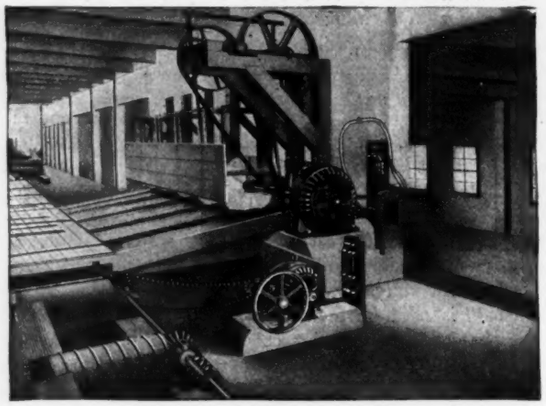


FIG. 1.—SLASHER DRIVEN BY INDUCTION MOTOR AND TABLE CONVEYOR DRIVEN BY BACK GEAR MOTOR.

smaller machines are started by merely throwing in the line switch. The larger motors, however, are equipped with oil-immersed auto-starters.

The operation of this mill has, it is said, more than fulfilled its owners' expectations. But 300 ihp is required for the operation of the complete mill with the exception of the resaw, a test not having been made since this new saw was installed. For the operation of the same equipment driven by means of belts and shafting with two engines 450 hp would be required under

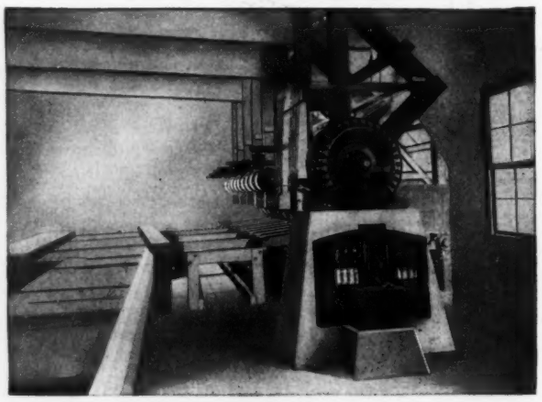


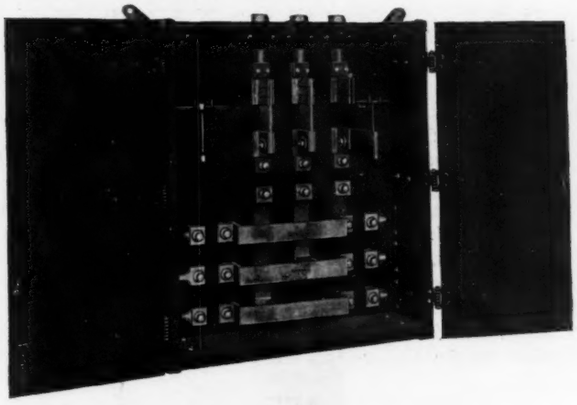
FIG. 2.—EDGER DRIVEN BY A 35-HP INDUCTION MOTOR.

the most favorable circumstances. Under average conditions of alignment, the power required would be considerably more; from 550 to 600 hp being a reasonable figure. It used to be considered that fuel cost was a negligible item, but this is no longer true, for the refuse which is consumed has a ready market, besides this there is so little refuse left in a modern mill that none remains to be disposed of even with the efficient electrically driven plant. The entire electrical equipment for this mill was furnished by the Western Electric Company.

Divided Service Box.

The divided service box brought out by the Ricker Manufacturing Company, of Rochester, N. Y., is made of heavy steel, lined with slate. The metal parts are made of cast copper free from all blowholes. The branch is cast solid to the through connections, eliminating the joints at this point, and the switch

on the service branch is of 1200-amp capacity. The box is designed to split a lighting main through a large consumer's building, the main being fused on each side of the service to insure the consumer uninterrupted service. This box is used in

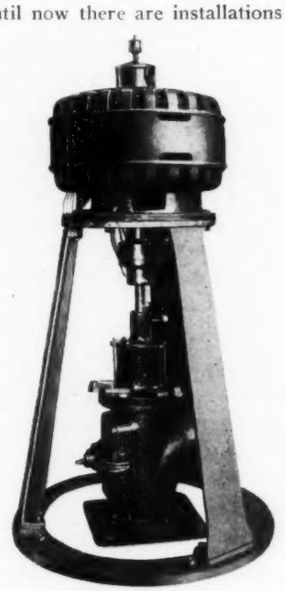


DIVIDED SERVICE BOX.

theaters, hotels and department stores using large quantities of electricity, where it is of very great importance that the service should not be interrupted by a burn-out or fuse blowing in the main at some other point.

Impeller Pump Installed for Condensing Service.

The development of impeller pumps was made primarily for pumping water for irrigation purposes from deep wells, because of the simplicity of the parts in the well and the ability of this type of pump to handle all the water such a well will produce. The field of application has widened considerably since these pumps came into use until now there are installations in many classes



IMPELLER PUMP.

of service. Shown herewith is a view of one of the 10-in. Columbus impeller pumps installed by Kingan & Company in their plant at Indianapolis, Ind. There are three pumps, all alike, installed here; two pump water from deep wells into the reservoir, from which it is used for condensing purposes for a Westinghouse steam turbine, rated at 500 kw. A third of these pumps is installed to raise the water from the well to a higher storage reservoir from which it flows by gravity throughout the plant. In each case the pump is equipped with a vertical Westinghouse induction motor of 75 hp, and takes energy from the two-phase alternating-current system at 440 volts, supplied for the entire plant from the turbo-generator set and from several engine-driven generators. The principle on which the pump works suggests that of the centrifugal pump, but the "impellers," as they are called, are placed horizontally within the casing and are spaced about 4 ft. apart along the shaft, to which the motor is direct-connected. The number of impellers depends upon the depth of the well. The lower two or three must be submerged at all times; that is, they must be below the lowest water level in the well. The water is whirled upward by the first impeller to a stationary vane located just beneath the second impeller. This vane, or "retarder" as it is called, stops the whirling motion of the water just before it enters the next impeller, but does not impede the upward progress. The second impeller then repeats the performance of the first, and so on, till the water is discharged at the top. The only wearing parts in the pump are the guide and thrust bearings, both of which are located at the top of the well, where they may be readily inspected and repaired when necessary. The thrust bearing is specially constructed with rollers, so that the friction is reduced, as it is rolling and not sliding friction. The vertical motor is thus not called upon to carry any weight but its own, but is coupled to the pump by a flexible coupling. In a test recently made on the pump installed for pumping into the reservoir at the Kingan plant, the pump handled 1121 gal. of water per minute, with an average power consumption of 43.2 kw, which means that the motor was running with an output of approximately 50 hp, or at two-thirds load. The pump was manufactured by the Roth Manufacturing Company, of Columbus, Ind.

Chicago Show Exhibits.

In addition to exhibits at the Chicago Electrical Show noted last week are the following:

THE ATTRACTOGRAPH COMPANY, Chicago, Ill., has an interesting exhibit of its moving and stationary illuminated signs. These are made in many styles.

THE CAMPBELL ELECTRIC COMPANY, Lynn, Mass., has an exhibit in which are shown samples of the company's one-day and eight-day time switches. These switches, which are of especial interest to central-station men, are designed for turning on and off the current of electric illuminated signs by the aid of a clock mechanism. The exhibit is in charge of C. P. Cook.

PYRO ONE-LIGHT ELECTRIC SIGN COMPANY, Chicago, Ill., is showing in a practical way the one-light Pyro electric sign in four different styles. These signs differ from the ordinary one-light sign in that the lamp is located in front of the sign and is covered with a reflector which throws the rays of the light directly onto the face of the sign. The representatives in attendance are: S. Samson, C. Mueller, C. M. Henderson, V. White, V. F. Hickerson, J. C. Maloney, Mr. Timlin, F. C. Mueller and M. C. Conley.

THE AMERICAN IRONING MACHINE COMPANY, Chicago, Ill., is showing its line of electrically heated and motor-driven ironing machines. The exhibit consists of a 48-in. gas-heated Simplex ironer with ¼-hp motor attached; a 37-in. Simplex ironer with a 220-volt heating coil and ⅛-hp attached motor; a 24-in. Simplex hand-operated machine with a 110-volt heating coil, and a new shirt-waist and electrically heated and operated puffing machine. The machines are so constructed that they may be operated in connection with any of the well-known electrically operated washing machines. The exhibit was in charge of H. G. Gross, G. A. Renner, B. G. Barker and Miss Blair.

Proposed Louisville Electrical Show.

A delegation composed of 35 members of the Louisville Commercial Club and officials of the Southern Electrical & Industrial Exposition Company, of Louisville, Ky., visited the Electrical Show at Chicago, Ill., on Jan. 21, 22 and 23. The party left Louisville on the evening of Jan. 20 and went to Chicago to get pointers on ways and means of successfully holding an electrical show, as well as to get ideas on decoration,

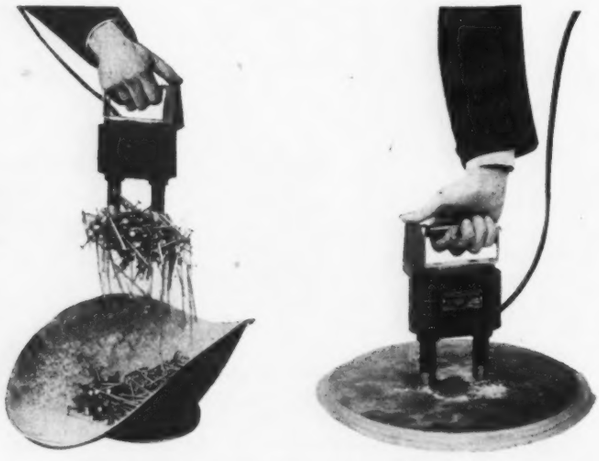
illumination and the methods employed by the Trades Exposition Company, which has so successfully brought off four Chicago electrical shows.

The Louisville Electrical Show will be held in the armory at Louisville, Ky., from April 12 to April 24, 1909. The representatives in the party assured the manufacturers of electrical apparatus who are exhibiting at the Chicago show that the Louisville attraction will surpass anything heretofore held. It will correspond in many respects to the Greater Louisville Exposition which was held in March, 1907, and is to be held for the purpose of educating electrically the people of the South, and to give them an opportunity of studying the improvements that have been made during the last few years in the manufacture and distribution of electricity, and the uses to which it can be put. The exhibits made at the last show, held under the auspices of the Commercial Club, were confined entirely to home-made products, but the club has decided to let down the bars this year and invite manufacturers from all parts of the United States to make exhibits. The building in which the show will be held has a floor area of 54,000 sq. ft. Among the officials who comprised the delegation that visited the Chicago Electrical Show were the following: Messrs Fred. W. Keisker, Julius V. Beckman, A. T. McDonald, Brinton B. Davis, Henry Besten, Lewis S. Streng, W. W. Stouffer, Andrew Broaddus and Robert E. Hughes.

Hand Type Lifting Magnet.

The device shown in the accompanying illustrations is a hand magnet weighing only about 7 lb., but capable of lifting castings weighing from 70 lb. to 100 lb. The magnet is designed for operation on 110-volt, direct-current circuits and is furnished with drop cord and attachment plug so that it may be readily attached to any ordinary lamp socket. The push-button mounted on top of the magnet and operated by the thumb closes the circuit to the coils and makes the magnet operative. On releasing the button the poles become demagnetized and the load is released.

The magnet should prove useful in machine shops for clearing chips and borings out of the machinery or removing them from parts of the work not easily accessible, as for instance from the bottom of a deep cylindrical casting. Dropped tools, bolts, boring bars, etc., are easily recovered with the aid of the magnet from places from which it would be difficult to fish them by ordinary means.



HAND-TYPE LIFTING MAGNET.

In shops where large quantities of brass and iron filings accumulate and which it is desirable to separate them before selling them as waste material, the magnet is especially useful, since the two metals can be separated by merely passing the magnet through the mixture. In the same manner tacks or nails can be separated instantly from brass screws with which they may have become accidentally mixed.

In foundries this magnet may be used to pick up hot or awkwardly shaped castings; smooth plates, which are sometimes difficult to handle when lying on a flat surface, or for cleansing the molding sand of minute particles of metal.

Suspended with its two poles immersed in the liquid the magnet will attract to itself any particles of iron or steel which it may be desired to remove from the tubs in which paints, glazes, chemicals, etc., are mixed.

One purchaser, who uses several automobile trucks in his business, has put this magnet to a novel use. He is paving an alley in the rear of his store with ashes, and finding that many nails from packing boxes, burned under the boilers, were mixed with the ashes, he is guarding against punctured tires by employing a magnet to remove nails from the ashes before strewing them in the alley.

The above-described hand magnet has been placed on the market by the Cutler-Hammer Clutch Company, Milwaukee, Wis.

Pocket Meter for Incandescent Lamps.

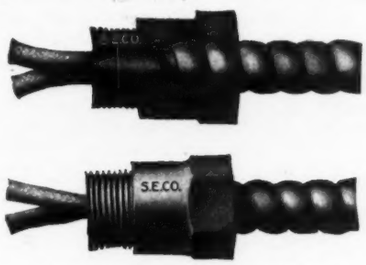
The increasing use of tungsten incandescent lamps has developed the demand for a device which will enable purchasers, salesmen or others interested in the use or sale of incandescent lamps readily to compare the relative efficiencies of the various types. To the ordinary user of lamps, who is invariably averse to paying the first high cost of tungsten lamps, there is no more effective method of showing the economy of tungsten lamps than a practical demonstration of the comparative watt consumption of the tungsten and ordinary carbon-filament lamps. With the view of meeting this new demand for a special type of meter to fulfil the conditions imposed, the pocket type of tungstometer, illustrated herewith, has been developed.

LAMP METER.

The latter instrument consists of three elements: a measuring system; a connection system, consisting of an insulating tube, on the upper end of which is secured a swivel-type Edison screw plug and on the lower end an Edison-type lamp receptacle; and a special computing scale located just below the meter, by the use of which the observer can measure the watt consumption of any lamp within the full scale of the range of the meter and at any voltage up to and including 250. As will be seen, the entire arrangement is symmetrical, the measuring elements being mounted at the center of the insulating tube and the computing scale so located that it can be readily used when reading the meter. The meter windings are so proportioned that currents up to and including 1.5 amp can be measured, and, as previously stated, the windings are likewise adapted up to and including 250 volts, a decided advantage to those having occasion to measure lamps widely varying in voltage range. By the use of the swivel-screw block the meter can always be used with the scale in full view of the operator, and the diameter and length of the supporting tube are such that it can be readily employed in connection with lamps using comparatively deep or heavy shades. The tungstometer will also be found useful in measuring the ampere consumption of tungsten lamps, especially when it is desired to run them in series. The scale is so proportioned that it can be read directly in mil-amperes, thus giving a combination of watt and mil-ampere readings which permits of an extremely wide application. The dimensions of the instrument are: Length, 7 in.; width, 2½ in., and depth, 1½ in. The total weight is 9 oz. This instrument is being put on the market by the Central Electric Company, Chicago, Ill.

Galvanized Watertight Stuffing Bushing.

A galvanized watertight stuffing bushing for Greenfield lead-covered, steel-armored conductors was recently put on the market by the Sprague Electric Company. The bushing is made of two parts, as shown in the accompanying cross-sectional view. One part consists of a male nipple having one end drilled out in a cup shape, while the other part is a hexagonal female cap. The cable is inserted in the bushing and the female cap pushed back over the armor; steam packing is then wrapped around the lead covering and steel armor of the conductors, and the female cap screwed to the male nipple. This forces the steam packing into the cup-shaped space formed in the nipple,



WATERTIGHT STUFFING BUSHING.

thus making an absolutely watertight joint in the bushing. The coupling is made for Nos. 10, 12 and 14 conductors.

Detachable Wireless Cluster.

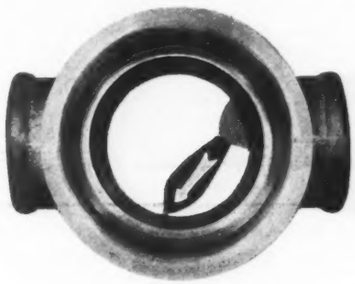
The Dale Company, of New City, has brought out a wireless cluster comprising a detachable base and cluster body; the former being screwed directly to the outlet box if used for close ceiling work. No insulating joint is needed and if the cluster is to be attached to a pendant, the base can be screwed

DETACHABLE WIRELESS CLUSTER.

to the pendant stem. The cluster body is attached by a simple push which securely locks it in position. There is no chance for the cluster to unscrew from the stem. It may, however, be readily detached by a pull without disturbing the wiring connections in case the shade is to be removed. All parts of the cluster are completely insulated with porcelain, no fiber insulation being needed. The cluster is made for from two to seven lamps and, all parts being interchangeable, the number of lamps may be increased within the limits specified by simply detaching the cluster body from the base and attaching one carrying the desired number of lamp sockets. The wiring, of course, remains the same. An advantage possessed by this type of cluster is that the detachable base can be installed and after the mechanics are out of the building, the bodies, shades, etc., may be quickly attached.

Water-Flow Indicator.

The device shown in the accompanying illustration has been developed for indicating the flow of liquid in pipe lines. It consists of a valve body, with inlet and outlet connections for piping. In the valve body is a pivot plate carrying an indicator or flap, with a red arrow in the casting. This pivot plate can



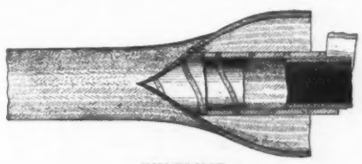
WATER-FLOW INDICATOR.

be moved into any position, which allows the device to operate in horizontal, vertical or angular connections. A glass disk held by a ring-nut allows free sight of the pivot at all times, so that one may be certain at a glance whether water is flowing. If water or fluid is not flowing through the pipe line the pivot will fall to a right angle with the axis of the indicator, thereby acting as a check valve, and showing the operator that the fluid is not moving.

The indicator is made for pressures not exceeding 250 lb. per square inch. It is particularly useful in connection with boiler feed lines, water-cooled transformers, jacket water lines for air compressors and internal combustion engines. It is being placed on the market by Mr. C. W. Bergen, 39 Cortlandt Street, New York.

Wireduct.

The American Conduit Manufacturing Company, Pittsburgh, Pa., is placing on the market "Wireduct," a new non-metallic flexible conduit, which is claimed to be distinctly different and superior to any flexible conduit heretofore invented. The inner tube of this conduit cannot be pulled out, it will not collapse under any circumstances, and extreme torsion and severe abuse have no effect upon the tube. It is stated that the bond between the middle tube and the fiber center of the conduit is so perfect that the two are literally one. The fiber comprising the body of



WIREDUCT.

"Wireduct" is a special compound possessing great elasticity and tensile strength and at the same time of such a character as to readily blend with the other elements of the tube. The tube is encased in an envelope of material which resembles the skin of the alligator in toughness and pliability and which, it is claimed, will not deteriorate, but retain its toughness and pliability for years. The manufacturers claim that they have discovered the missing link in conduits and found the long sought elements which will render flexible tubing always pliable and ready for use after long storage.

Industrial and Commercial News

Commercial Intelligence.

THE WEEK IN TRADE.

There has been little improvement in trade during the past week although conditions are gradually growing somewhat better. Some orders are coming to the wholesalers and the jobbers for immediate delivery and a few of moderate size are being placed for the spring. The general rule, however, is conservatism, and many retail merchants are only ordering to fill their actual needs. Good reports come from the leading dry goods centers of the East, where there is a considerable demand for cotton goods. The big manufacturers of fertilizers are beginning to feel the near approach of spring by the number of inquiries coming from the agricultural sections. In the retail trade the best reports are those which are received from the North and West, where post-election cut-rate sales are still actively in progress. In the South trade is still dragging owing to the lack of money in the hands of the planters. Cotton holding continues to be in evidence, and this, of course, makes collections slow in that section of the country. It furthermore has a direct bearing upon the orders from retail merchants who are not willing to stock up anew when they have not received payment for the goods they sold during 1908. In the leading industries there is still a gradual tendency toward resumption of activity, but it is coming much slower than had been hoped for during the fall. Very few manufacturers are running up to normal, and many of them are but little improved from the conditions which prevailed before the election. The uncertainty as to tariff changes has much to do with this tardiness in the return to ordinary business conditions. Neither the manufacturer nor the wholesaler is willing to commit himself very extensively while the tariff rates are a matter of so much doubt. In the electrical and kindred industries the condition is about the same as in other manufacturing lines. The Western Electric Company, for instance, announces through one of its five important officials that while some orders are being booked and there is an increase in the volume of inquiries, conditions are really very little improved from what they were four months ago. So far the January sales have been better than those for December, but the improvement is so slight that it is not worth boasting about. The Allis-Chalmers Company reports that it is operating between 65 and 70 per cent of its full capacity. It announces that the business booked during the first week of January amounted to 60 per cent of the business taken during the entire month of December, but frankly admits that this spurt cannot be taken as an average. The Otis Elevator Company reports an increase in orders, but says that none of them has been very large. The best business is coming from the Central West. The New York Air Brake Company says that its plants, both here and in Russia, are working full time and that the prospects for good earnings during the coming year were very bright. Taken as a whole, the iron and steel markets continue to be very dull and the sales of pig iron are unusually light. The demand for steel rails has not yet begun. Failures for the week ended Jan. 21, as reported by *Bradstreet's*, were 307 as against 319 for the previous week, 408 in 1908, 252 in 1907, 276 in 1906 and 228 in 1905.

THE COPPER MARKET.

The market for copper metal is beginning to show the effects of the long strain under which it has been to support prices. During the past week prices have receded a half cent in this market and still the purchases of consumers have not developed. It is not out of the way to say that the market is distinctly weak. There is still the same persistent effort on the part of the large interests producing copper to sustain prices, but there is in evidence more pressure to sell than at any time within the past three months. It is also worth noting that speculators appear to have suddenly grown timid and are not taking hold of future warrants. As is always the case, the lower the market goes the less anxious the consumers seem to buy. When copper, a few years ago, was quoted at 25 cents a pound the consumers were clamoring for metals. With copper down near 13 cents there seems to be no anxiety to stock up. In this respect the American consumer is unique. In Europe a recession in price, as a rule, stimulates buying. It is probable that at the present time there is a more general belief that the accumulation of copper is heavy than there has been at any time during recent months. The protests of the producers and selling agencies that the surplus is exaggerated are having less effect. The known figures of production and the estimates of consumption leave such a wide margin of surplus that even some of the sanguine copper boomers are beginning to be doubtful. In the meantime the market is awaiting with much interest the result of the new organization for collecting copper statistics. There is much uncertainty about what will be the program of this new association of copper producers. It is not even known whether the statistics that are collected and compiled by Mr. Graton will be made public or not. There is one thing upon which the market is pretty thoroughly agreed and that is that the figures will not be tampered with in order to sustain prices. Whether they are to be given to the public or whether they are to be used for the private information of the members of the association has not yet been announced. During the past week there has been very little demand from consumers either in this country or Europe and no large sales have been reported in this market. The exports have been running at about the rate of 20,000 tons per month; the imports have been fairly large and it is safe to calculate that the production of the American mines is over 100,000,000 lb. per month. This combination of figures, of course, must leave at the end of each month a considerable surplus. One of the leading interests in the wire industry estimates that at the present time about 25 per cent of the entire copper production is being taken by the wire manufacturers. In ordinary times more than 50 per cent is thus employed. Other branches of industry are even less active than the wire drawers. The exports for the month up to and including Jan. 25, were 17,394 tons. Prices quoted on the Metal Exchange Jan. 25 were:

Lake	14 @ 14½
Electrolytic	13⅝ @ 13¾
Castings	13½ @ 13⅝

London prices were as follows:

	Noon.	Close.
	£ s d	£ s d
Standard copper, spot	59 12 6	59 12 6
Standard copper, futures	60 10 0	60 11 3
Market	Easy.	Steady.
Sales of spot		600 tons
Sales of futures		800 tons

Extreme fluctuations for this year:

	Highest.	Lowest.
Standard	....	....
Lake	14.55	14.12½
Electrolytic	14.25	13.70
Casting	14.12½	13.57½
London, spot	£64 2 6	£59 12 6
London, futures	64 17 6	60 10 0
London, best selected	67 15 0	64 10 0

REPORTED LARGE WIRE PURCHASE DENIED.—The announcement made from Boston last week in copper and financial circles that the Bell Telephone Companies had entered into a contract with a Connecticut wire-drawing concern for very large tonnages of copper wire at about 14½ cents per pound for electrolytic seems to have been to a large extent mythical. Such reports are not entirely unusual in the present copper market and Boston soil seems to be particularly fertile for their growth. A high official in the American Telephone & Telegraph Company, with headquarters in this city, said to a representative of this journal when he was informed of the published report: "There is nothing to it. Some of the small subsidiary companies may have bought wire for their immediate needs, but there have been no purchases of heavy tonnages such as this publication declares. I am in a position to know positively concerning any important copper contract and I tell you that none has been made. Just at present we do not need any great amount of wire and we certainly are not going to buy it and store it with the copper market in its present uncertain state."

THE COMMONWEALTH EDISON COMPANY OF CHICAGO has acquired another large piece of land adjoining its present plant, consisting of a tract of about 6 acres fronting 1100 ft. on Center Avenue, and with a depth of 248 ft. to the Allens Canal.

REPORT OF JAPANESE ELECTRIFICATION.—The report, which was generally published in the New York daily papers, that an order had been signed for $7,000,000 worth of electrical apparatus and equipment to be used in the electrification of an Imperial Japanese Railway system appears to have been exaggerated and premature. While it is well known that the government of Japan is considering the electrification of its railways it is practically a certainty that no contract of this magnitude has been signed as yet. A Japanese engineer, who is now in New York, said in reference to the electrification plans of the country: "The Imperial Engineering Corps has recently completed a most exhaustive report upon the practicability and economy of electrifying all the railways of the Empire. The work settled to be done in eliminating steam railway traction in the zone of Tokio is to be begun at once; other sections will be electrified as soon as the money can be found. Japan is well conditioned for generating hydro-electric power. The country is for the most part mountainous and has many rivers and streams that can be made to yield energy for hydro-electric power at very low cost. Such power plants in Japan will never lack abundant water supply. For large units of electrical power and for many kinds of power machinery and apparatus Japan is a good market. The country is not yet supplied with manufactories for the construction of heavy machinery of this kind. Many establishments are making small motors, but we must go outside for our large installations." Speaking of the report that an order for $7,000,000 worth of apparatus has been placed, an official of the General Electric Company said: "I have no doubt that this story refers to some recent sales which the General Electric Company has made in Japan. Our Mr. M. A. Oudin, who has recently returned from an extended stay in Japan, made sales to the Imperial Government of considerable large apparatus. It amounted, however, to nothing like the figure mentioned in the published statement. I take it that this story is but an exaggeration of our sales. It is true that extensive electrification is planned and Japan may be ready to order a considerable amount of apparatus in the near future, but I am positive that no such contract has been let because the General Electric Company is certainly in a position to have known all about it. We have paid particular attention to the Japanese trade."

THE L. S. MONTGOMERY COMPANY, Atlanta, Ga., has succeeded to the business of L. S. Montgomery of the same place, and filed application for a charter with a capital of $5,000 and the privilege of increase to $50,000. The firm will conduct a manufacturers' sales and distributing agency, and do an electrical specialty jobbing business in the Southern territory. Offices are being established in the Empire Building, Atlanta, and stock will be carried in a warehouse. We are requested to say that catalogs and trade literature will be appreciated.

TO SUPPLEMENT WATER POWER PLANTS.—The General Electric Company has sold to the Albany & Hudson Railroad Company, at Hudson, N. Y., a 1500-kw steam-turbine installation. This railroad, which has been largely dependent on hydro-electric plants for its power, has been seriously handicapped by the severe drought of the past season. It is the present purpose to install a capable steam plant as an auxiliary.

Financial Intelligence.

THE WEEK IN WALL STREET.

The stock market for the past week has been as near featureless as it is possible to imagine. Trading has been unusually light and almost exclusively professional in character. The changes for the week have been in most instances fractional and the causes for such changes have had little to do with conditions of trade or the ordinary news which is expected to affect markets. The slight advances which occurred about the middle of the month can most reasonably be attributed to the determination on the part of those interests which are sustaining prices to frighten, if not to punish, certain bear elements which had begun to grow too bold. This unruly element having been chastised, the market settled into a condition of apathy. The condition of the copper market had something to do with the movement of Amalgamated and other copper stocks, but the very substantial support which has been constantly under these issues was sufficient to prevent any serious break. The report of the Amalgamated Copper Company was not considered encouraging, although it more than earned the dividend that was paid and piled up a surplus of at least $1,000,000. The most discouraging feature in the report is the indication that it costs at least 11 cents for the Amalgamated company to produce and market a pound of copper. This means that even with a production of 200,000,000 lb. a year the company must be able to sell its product at something like 15 cents in order to be able to pay reasonable dividends on its capitalization. The uncertainty of the tariff schedule on iron and steel products is considered a disturbing element to these issues. There is no doubt about there having been an organized movement on foot to advance United States Steel common to a higher point than that at which it is now quoted. This movement has been seriously hampered by the talk of free trade on steel products. While it is not anywhere believed that Congress will take off the tariff entirely, it is the almost universal opinion that the present rates will be materially lowered. The question then comes whether or not the Steel Corporation can earn its present dividends upon its vast capitalization. Upon these subjects there are almost as many opinions as there are traders in the Street. In almost every market the allotment of these bonds was immediately oversubscribed. There still seems to be plenty of money in Europe, as there is in America, for investment in any good interest bearing bonds. That there is still a great abundance of money in the New York banks is indicated by the daily rates, which are as low as they were during the dull season of 1908. Neither the withdrawals of the United States Treasury nor the floating of new bond issues seems to have any effect upon the amount of cash on hand or upon the rates of interest. Call money on Jan. 25 was quoted at 1½ @ 1¾ per cent and 90-day loans were made at 2½ @ 2¾ per cent. The quotations in the table are those of the close on Jan. 25.

NEW YORK.

	Jan. 18.	Jan. 25.	Shares sold.		Jan. 18.	Jan. 25.	Shares sold.
All.-Ch.	14⅞	14½*	3,100	Int.-Met.. pfd.	45½	43⅞	53,170
All.-Ch., pfd.	47¾	46¾	3,685	Mackay Cos.	75	71⅞	2,000
Amal. Cop.	78	79	163,710	Mackay Cos.,pfd.	70*	70½	150
Am. D. T.	35*	35*	———	Manhattan Elev.	151*	150½*	820
Am. Loc.	56	57	7,080	Met. St. Ry.	34	34*	100
Am. Loc., pfd.	111*	112	———	N.Y. & N.J. Tel.	113*	115	94
Am. Tel. & Cbl.	75½	75½*	20	Steel, com.	52¼	54	416,625
Am. T. & T.	126	126	5,750	Steel, pfd.	113¾	114⅛	16,551
B. R. T.	70¾	70¼	78,725	W. U. T.	68¾*	69½	3,700
Gen. Elec.	155½*	156	2,300	West'h., com.	81	82⅛	4,700
Int.-Met., com.	16⅛	15¾	17,695	West'h., pfd.	115	115*	400

PHILADELPHIA.

	Jan. 18.	Jan. 25.	Shares sold.		Jan. 18.	Jan. 25.	Shares sold
Am. Rys.	45	44½*	———	Phila. Elec.	11⅝	12	———
Elec. Co. of A.	11⅛*	11	———	Phila. R. T.	26	28¼	———
Elec. Stor. B'ty.	44	45	———	Phila. Traction..	91	92⅜	———
E. S. B'ty, pfd..	49*	49*	———	Union Traction..	52¼	54⅛	———

CHICAGO.

	Jan. 18.	Jan. 25.	Shares sold.		Jan. 18.	Jan. 25.	Shares sold.
Chi. City Ry.	180*	180*	———	Chi. Tel. Co.	127⅜	128	———
Chi. Rys., Ser.1.	116*	116*	———	Met. El., com.	17*	17*	———
Chi. Rys., Ser.2.	45½*	45	———	Nat'nal Carbon.	84	84	———
Com. Edison.	108	107½	———	Nat. Carb., pfd.	110	110*	———
Chi. Subway.	26⅞	26	———				

BOSTON.

	Jan. 18.	Jan. 25.	Shares sold.		Jan. 18.	Jan. 25.	Shares sold.
Am. Tel. & Tel.	126¼	126	———	Mex. Tel.	2½	2½*	———
Cum. Tel.	125	125	———	Mex. Tel., pfd..	5½*	5½*	———
Edison El. Ill.	246	251⅞	———	N. E. Tel.	130	131	———
Gen. Elec.	156*	156	———	W. Tel. & Tel..	8*	8*	———
Mass. Elec. Ry.	12	13	———	W. T. & T., pfd.	82	79	———
Mass. E. R., pfd.	59½	63½	———				

*Last price quoted.
Shares sold are for week Jan. 18 to Jan. 23.

DIVIDENDS.

Albany (N. Y.) Home Telephone Company, quarterly, common, 1 per cent, paid Jan. 20.

American District Telegraph Company, of New Jersey, quarterly, common, 1 per cent.

American Gas & Electric Company, of Philadelphia, Pa., quarterly, preferred, 1½ per cent, payable Feb. 1.

Beaumont (Tex.) Ice, Light & Refrigerating Company, quarterly, 2½ per cent, payable Feb. 1.

Connecticut Railway & Light Company, Bridgeport, Conn., quarterly, common, 1 per cent, payable Feb. 15.

Connecticut Railway & Light Company, Bridgeport, Conn., quarterly, preferred, 1 per cent, payable Feb. 15.

Edison Electric Illuminating Company, Boston, Mass., quarterly, common, 2½ per cent, payable Feb. 1.

Harrisburg (Pa.) Traction Company, semi-annual, common, 3 per cent, payable Feb. 1.

Helena Light & Railway Company, Helena, Mont., quarterly, preferred, 1¼ per cent, payable Feb. 1.

Houston (Tex.) Electric Company, semi-annual, preferred, 3 per cent, payable Feb. 1.

International Steam Pump Company, New York, N. Y., quarterly, preferred, 1½ per cent. payable Feb. 1.

Montreal Light, Heat & Power Company, Montreal, Que., quarterly, common, payable Feb. 15.

Municipal Gas Company, Albany, N. Y., quarterly, common, 2¼ per cent, payable Feb. 1.

New York & Queens County Electric Light & Power Company, Long Island City, N. Y., semi-annual, preferred, 2½ per cent, payable Feb. 10.

Twin City Rapid Transit Company, Minneapolis, Minn., quarterly, common, 1¼ per cent, payable Feb. 15.

Washington (D. C.) Gas Light Company, quarterly, common, 2½ per cent, payable Feb. 1.

Western Telephone & Telegraph Company, Boston, Mass., semi-annual, preferred, 2½ per cent, payable Feb. 1.

ROBERT MATHER HEADS WESTINGHOUSE BOARD.—The selection of Mr. Robert Mather as chairman of the board of directors of the Westinghouse Electric & Manufacturing Company has been announced. It is regarded as a very satisfactory move. Mr. Mather, while he is a lawyer by profession, is best known as an able financier and man of affairs. As chairman of the board of directors he will have full charge of the financial affairs of the Westinghouse company. His selection is due to those financial and banking interests which have united to make the rehabilitation of the company possible. He is known as an active organizer, a shrewd student of current conditions, and a man of conservative tendencies. But there are other reasons which seem to make the selection of Mr. Mather a particularly sagacious one at this time. It should be remembered, that he is president of the Rock Island Company, vice-president of the St. Louis & San Francisco Railroad Company and head of the law department of all the Rock Island and Frisco lines. In addition to this Mr. Mather has a wide and intimate acquaintance with the officials of all the great roads centering in Chicago and in that section of the country. Just at this time when Chicago and almost all of the other large cities of the West are beginning to clamor for the electrification of all urban and suburban lines, the advantage to the Westinghouse of having at the head of its board a man in close touch with railroad officials is apparent. Mr. Mather thoroughly understands the railroad situation in the West, and he will be able to render valuable services to the company in the new field of activity. With the return of prosperous or even normal business times, it is probable that the electrification of steam road terminals will be rapidly pushed forward, and this branch of the industry will certainly rival the development of new lighting and traction schemes. Already a bill has been passed by the Illinois Legislature requiring the railroads centering in Chicago to change from steam to electricity within the city limits. Many of the larger roads are also considering the policy of operating their suburban lines by electricity. All of this means large business for the manufacturers of heavy electrical apparatus, and the Westinghouse will lose nothing by having "a friend at court" when the consideration of contracts comes. At the same meeting of stockholders at which Mr. Mather was chosen chairman of the board of directors, Mr. Charles A. Terry, for many years the efficient and devoted secretary of the company, was advanced to the position of vice-president. The practical direction of the company's affairs will remain entirely in the hands of Mr. George Westinghouse, the president.

MEXICAN LIGHT & POWER COMPANY PROSPEROUS.—The report of earnings for the Mexican Light & Power Company for the full year 1908 shows gross earnings of $5,876,947, which is an increase of $946,577 over the previous year; total expenses, $2,161,140, an increase of $210,997; net earnings, $3,715,807, an increase of $735,580. A dividend of 3½ per cent was paid out of the earnings and after charging off large sums to construction and depreciation accounts a balance of $910,823 was credited to surplus. Sir Edward Clouston, president of the company, outlined the future plans of the company as follows in his report to the stockholders: "Owing to the great and unexpected demand for service it has been decided to double the capacity of the hydro-electric plant at Necaxa and to develop other water rights granted to the company by the government of Mexico which it was not believed until recently would be needed for many years to come. The usual dry season in Mexico during the first six months of the year will be a critical period for the operation of the plant, and this year there will be a considerable consumption of coal which will hereafter be saved when the three new reservoirs, for which plans have been made, have been put in commission."

AMALGAMATED COPPER COMPANY DIVIDEND.—The Amalgamated Copper Company has declared the usual quarterly dividend of ½ of one per cent, thus keeping the stock on a 2 per cent basis. It is clearly the policy of the company to limit the disbursements until prosperity has undoubtedly returned, although the figures of the company indicate that it is earning considerably more than the amount of dividend declared. During the year 1908 the company produced 156,430,700 lb. of copper and at the December rate will produce 208,000,000 lb. in 1909. It is stated that it costs from 11 to 11½ cents to produce and market this copper. As the average selling price in 1908 was about 14¼ cents the company ought to show $1,000,000 surplus and in 1909 should earn at least 4 per cent on its capital.

OHIO TRACTION DEAL RUMOR.—The report that New York capitalists, headed by S. J. Dill, of the Elmira Light & Railway Company, are negotiating a deal involving $10,000,000 for the properties of the Mahoning & Shenango Railway & Light Company, of Youngstown, Ohio, seems to be premature. It is true that Mr. Dill was in Ohio and made some investigations of the property, which it is known is for sale, but further than that nothing has been done. A member of the engineering firm of Sanderson & Porter—which firm was instrumental in merging the properties into the present company—said that there was absolutely nothing in the shape of a deal on hand. Engineers for prospective purchasers had looked at the property, but so far there had been no negotiations involving prices.

MICHIGAN STATE TELEPHONE COMPANY.—The establishment of a 6 per cent annual dividend rate for the common stock of the Michigan State Telephone Company, Detroit, Mich., was mentioned in the *Electrical World* of Jan. 21, 1909. The report of the company for the 11 months ended Nov. 30, 1908, is now available, and shows as follows: Gross earnings, $3,113,697; general expenses, rentals, taxes, maintenance, reconstruction, $2,268,105; net earnings, $845,592; interest, $382,163; balance for dividends, $463,163; preferred dividends, $125,569; surplus, $337,859; common dividends, $69,184; net surplus, $268,675.

AMERICAN DISTRICT TELEGRAPH COMPANY.—The American District Telegraph Company, New York, has just made public its report for the year ended Dec. 31, 1908. Compared with the previous year it shows gross revenues of $492,896, as compared with $586,066 in 1907; expenses, $424,790, compared with $506,037. The deficit after paying dividends for the year was $8,782. The year previous there had been a surplus of $2,143. The report says that the capital stock remained during the year at $3,844,700. The number of miles of wire in operation on Dec. 31 was 1596; number of offices, 79; number of instruments in circuit, 34,990; total number of messages delivered 4,168,247; total number of messages collected, 2,451,394.

RAILWAY MERGER IN CENTRAL NEW YORK.—The stockholders of the Rochester Railway, the Rochester & Sodus Bay Railway and the Rochester & Eastern Rapid Railway have voted in favor of the proposed merger of the three companies into the New York State Railways, which is designed to take over as a holding corporation all the electric railways in New York State controlled by the Central Railway Syndicate.

TRACTION CONSOLIDATION IN PENNSYLVANIA.—The Susquehanna Railway & Light Company, of Lancaster, Pa., has purchased the property and franchise of the Philadelphia, Coatesville & Lancaster Railroad Company, paying $137,500 for it. The purchasing company, which is largely controlled by New York capitalists, will now have a trolley system which through connecting lines will reach into Philadelphia.

EDISON ELECTRIC ILLUMINATING COMPANY.—Of the 9,725 shares of new stock of the Edison Electric Illuminating Company, Boston, Mass., offered stockholders as of record on Dec. 18, less than 150 shares remained unsubscribed at the close of subscriptions on Jan. 22. Subscriptions are payable $100 on Feb. 1 and $115 on March 3. The stock not subscribed for by the stockholders will be sold at public auction.

STORAGE BATTERIES FOR BALTIMORE & OHIO.—The Westinghouse Machine Company has sold recently to the Baltimore & Ohio Railroad Company a large order of storage batteries for use in the tunnel service of that railroad in the city of Baltimore.

HUDSON RIVER ELECTRIC POWER COMPANY.—The report made by Stone & Webster to James R. Hooper, chairman of the bondholders' committee of the Hudson River Electric Power Committee, deals with the physical condition of the property and its facilities for successful operation. There are two groups of properties, those in the Hudson Valley, and those at or near Utica. The Hudson Valley properties are largely operated by water power, but are supplemented by a small steam installation of their own and by larger ones of their customers. The Utica system is entirely steam operated. The total value of all the property of the companies is estimated to be $6,234,000, of which the Spier Falls plant is estimated to be worth $2,250,000. For the first seven months of 1908—the period for which the report was prepared—almost every one of the subsidiary companies lost money. The report is taken to mean the necessity of a radical reorganization. Steps have been taken by the bondholders' committee of the Hudson River Water Power Company to have the Trust Company of America foreclose the mortgage securing the first mortgage bonds.

RHODE ISLAND COMPANY, PROVIDENCE, R. I.—The Rhode Island Company has been added as a defendant to the suit brought by United States District Attorney French on behalf of the government in which he cites the New York, New Haven & Hartford Railroad, the Boston & Maine Railroad, the Providence Securities Company and the Consolidated Railway of Connecticut as defendants, and charges them with violation of the Sherman anti-trust law in the merging of railroad and railway interests. The Rhode Island Company was not mentioned at first, but the amendment alleges that this company, which operates and owns practically all the urban and interurban railways in Rhode Island, in June, 1907, transferred to the Providence Securities Company all its holdings in the Providence & Burrillville Street Railway, in the Columbian Street Railway, and the Woonsocket Street Railway. The Providence Securities Company transferred control of these properties to the New York, New Haven & Hartford Railroad on Jan. 1, 1908, it is alleged.

SAN DIEGO CONSOLIDATED GAS & ELECTRIC COMPANY.—W. P. Bonbright & Company, New York, offer for subscription at 98½ and interest $250,000 of 5 per cent first and refunding mortgage gold bonds of the San Diego Consolidated Gas & Electric Company, San Diego, Cal. At present there are outstanding $1,250,000 of the company's authorized issue of $1,500,000. They are dated April 20, 1905, and are due April 20, 1935, and are subject to call on or after April 20, 1910, at 102 and interest. The proceeds from the sale of part of the bonds of this offering have been used to retire $193,000 outstanding prior lien first mortgage 6 per cent bonds, which makes this issue a first and only lien upon the entire property of the company.

INTERBOROUGH-METROPOLITAN COMPANY.—At the annual meeting of the stockholders of the Interborough-Metropolitan Company the retiring directors were re-elected. Theodore P. Shonts, president of the company, said that conditions affecting the property have improved since the last meeting. Mr. Shonts is quoted as saying in an informal conversation with some of the shareholders after the meeting that the company had not yet decided whether or not it would retain its interest in the Metropolitan Street Railway, about $43,000,000 of whose stock it holds. Receipts and disbursements will not be made public by the company at this time.

CONSOLIDATED GAS, ELECTRIC LIGHT & POWER COMPANY.—E. H. Rollins & Sons, Boston, Mass., offer for subscription at 86½ $2,500,000 of 4½ per cent general mortgage bonds of the Consolidated Gas, Electric Light & Power Company, Baltimore, Md., dated Feb. 14, 1905, and due Feb. 14, 1935. The bonds are a first lien on the main electric generating station of the company, which controls the entire gas and electric light and power business of Boston, and are part of a total authorized issue of $15,000,000, of which $9,832,000 are outstanding.

LAKE SUPERIOR CORPORATION.—In the *Electrical World*, issue of Jan. 7, 1909, mention was made of the purchase by Robert Fleming, London and New York, of the holdings of a syndicate of Philadelphians in the Lake Superior Corporation, Sault Ste. Marie, Mich., for English and Canadian interests. In accordance with the plans of Mr. Fleming and his associates W. K. Whigham, London, Eng., and Walter Gow, Toronto, were elected directors of the Lake Superior Corporation on Jan. 21, to succeed James Hay, Philadelphia, and Thomas Gibson, Toronto.

SYRACUSE & SUBURBAN RAILROAD, SYRACUSE, N. Y.—A syndicate headed by Mr. John J. Stanley, vice-president of the Syracuse (N. Y.) Rapid Transit Railway, as syndicate manager has purchased the capital stock of the Syracuse & Suburban Railroad, Syracuse, N. Y.

AMERICAN GAS & ELECTRIC COMPANY.—Mr. W. T. Hanson has been elected a director of the American Gas & Electric Company, New York City, to succeed Mr. R. T. Paine, 2d.

REPORT OF EARNINGS.

	Gross earnings.	Expenses.	Net earnings.	Charges.	Surplus.
Cape Breton Electric Company, Ltd., Sydney, C. B.:					
November, 1908	$21,789	$11,312	$10,476	$4,896	$5,579
November, 1907	23,384	12,496	10,887	4,842	6,044
Dallas (Tex.) Electric Corporation:					
November, 1908	105,194	66,355	38,839	28,394	10,444
November, 1907	103,206	62,246	40,960	29,479	11,480
Edison Electric Illuminating Company, Brockton, Mass.:					
November, 1908	22,627	9,785	12,841	3,267	9,574
November, 1907	20,722	10,067	10,655	1,416	9,238
El Paso (Tex.) Electric Company:					
November, 1908	47,597	34,684	12,913	7,508	5,405
November, 1907	46,431	30,673	15,758	6,158	9,598
Galveston-Houston Electric Company:					
November, 1908	104,446	59,593	44,853	20,941	23,912
November, 1907	89,740	53,674	36,066	19,907	16,157
Houghton County Traction Company, Houghton, Mich.:					
November, 1908	21,591	12,063	9,529	5,836	3,693
November, 1907	19,816	12,361	7,456	4,776	2,680
Houghton County Electric Light Company, Houghton, Mich.:					
November, 1908	27,566	10,506	17,059	5,388	11,669
November, 1907	25,803	10,673	15,130	3,781	11,349
Lowell (Mass.) Electric Light Corporation:					
November, 1908	33,328	17,231	16,096	3,571	12,525
November, 1907	30,074	16,809	13,265	4,225	9,039
Milwaukee Electric Railway & Light Company, Milwaukee, Wis.:					
December, 1908	401,110	173,325	230,784	101,915	128,868
December, 1907	362,754	176,156	186,598	102,159	84,438
Year ended December, 1908	3,991,104	1,938,804	2,007,299	1,197,201	81,720
Year ended December, 1907	3,926,666	1,974,721	1,951,945	1,184,604	76,340
Milwaukee Light, Heat & Traction Company, Milwaukee, Wis.:					
December, 1908	182,359	30,425	151,934	60,731	91,203
December, 1907	135,010	30,499	104,510	57,065	47,445
Year ended December, 1908	1,471,477	371,071	1,100,405	716,941	383,464
Year ended December, 1907	1,172,277	359,441	812,836	561,751	251,085
Minneapolis (Minn.) General Electric Company:					
November, 1908	103,750	40,113	63,637	33,444	30,193
November, 1907	92,813	40,229	52,584	26,674	25,910
Northern Texas Electric Company, Ft. Worth, Tex.:					
November, 1908	93,282	55,631	37,651	14,915	22,736
November, 1907	83,568	47,385	36,183	14,102	22,081
Puget Sound Electric Railway, Tacom, Wash.:					
November, 1908	136,731	94,261	42,470	43,398	*930
November, 1907	135,452	85,529	49,923	42,799	7,165
Seattle (Wash.) Electric Company:					
November, 1908	398,795	236,679	162,116	95,797	66,319
November, 1907	369,584	222,626	146,958	83,756	63,193

*Deficit.

GENERAL NEWS

Construction News.

BIRMINGHAM, ALA.—A movement is on foot among the merchants of Birmingham looking toward the construction of an electric light plant in the near future. A company is being formed to carry out the project. Louis Pizitz and S. Capen are interested in the enterprise.

FLORENCE, ALA.—The Sheffield Company is considering the question of extending its electric railway to the Florence University, two miles north of the town, and also to establish a more direct line to East Florence. J. W. Worthington is vice-president.

LINEVILLE, ALA.—Arrangements are being made to install an electric light plant at Lineville, for which contracts for machinery, it is said, have been placed. Dr. B. M. Smith is interested in the enterprise.

SAMSON, ALA.—The citizens have voted to issue $25,000 in bonds, the proceeds to be used for the construction of an electric light plant and water works system. W. J. Gresham is Mayor.

DOUGLASS, ARIZ.—The Treadwell Company, it is said, is planning to construct a large power plant to operate its stamp mill. The plant is to be located on the Taku River and will cost about $800,000. Robert McKenzie is general superintendent.

MESA, ARIZ.—Dr. A. J. Chandler has applied for a franchise to construct and operate a street car line on Main and McDonald Streets.

EL DORADO, ARK.—The El Dorado Light & Water Company, recently incorporated with a capital stock of $50,000, has purchased the local electric light plant. It is said that the company will not make any additions to the plant before September. J. P. Holmes is president.

MAMMOTH SPRINGS, ARK.—It is reported that the plant of the Mammoth Springs Electric Light & Power Company has been destroyed by fire, causing a loss of about $8,000. The plant furnished electricity in Mammoth Springs, Ark., and Thayer, Mo.

PRAIRIE GROVE, ARK.—The question of establishing an electric light plant in this city is under consideration. For further information address Dr. W. H. Mack, secretary of Board of Trade.

EUREKA, CAL.—The Humboldt Traction Company contemplates the installation of a 400-kw unit, consisting of an engine and generator, in its plant. A boiler will also be installed.

FRESNO, CAL.—Plans are being considered by the Fresno Light & Power Company to increase the output of its plant in the near future and extend its transmission lines to the towns of Clovis, Sanger and Lomoore, to furnish electricity for lamps and motors. A. G. Wishon is manager.

GREENVILLE, CAL.—The Round Valley Land & Power Company, which is installing an electric plant west of Greenville, has placed contracts with many of the farmers in Plumas County to furnish electricity to operate pumps to irrigate their farms. It is also stated that the company will furnish electrical energy to six towns in this vicinity, which have been using petroleum for lighting, as soon as the company can erect its transmission lines from the central plant. C. K. Reid is interested in the project.

HOLTVILLE, CAL.—Work has commenced on the construction of the new power plant of the Holton Power Company, on the Alamo River, below the present power House in Holtville. James Stratton has charge of the work.

OROVILLE, CAL.—J. H. Richardson has been granted a franchise to construct and operate a telephone line from Richardson Springs to Chico.

OROVILLE, CAL.—The Oro Water, Light & Power Company is extending its transmission lines through the Central House and Honout sections to supply electricity to operate several pumping plants.

SAN ANDREAS, CAL.—The Mokelumne River Power & Water Company has filed notice of appropriation of 5000 cu. in. of water of the south branch of the middle fork of the Mokelumne River, to be diverted at Cadish Dish.

SAN FRANCISCO, CAL.—Plans are being prepared by the Great Western Power Company to construct a large dam in Plumas, for which options on lands have been secured and steps taken for the construction of the dam. Work will begin upon the completion of its projected dam at Big Meadows. The company proposes to erect a large generating plant at the dam.

YREKA, CAL.—The Siskiyou Electric Light & Power Company, it is said, has decided to extend its transmission line at once from Montague to Dunsmuir, for which poles, wire and transformers have been ordered for the entire installation. The company will install another 1125-kw generator in its plant at Fall Creek, and is also extending its transmission lines down the Klamath River seven miles, to furnish electrical service to the mines in that vicinity. The new extension will serve Gazelle, Edgewood, Weed, Sison and Shasta Springs. J. Rosborough, Oakland, Cal., is secretary.

MERIDEN, CONN.—The Meriden Electric Light Company has been awarded the contract to install tungsten lamps on the streets and sections of the city now lighted by Welsbach lamps. The contract calls for at least 184 lamps by May 1.

WILMINGTON, DEL.—Mayor Wilson has returned without his approval the resolutions adopted recently by the Street and Sewer Commissioners, granting the Commercial Light, Heat & Power Company and the Delaware Electric Transmission Company, affiliated concerns, an extension of two years in time allowed for fulfilling the obligations contained in the franchises, one of which was to make certain payments to the city.

WASHINGTON, D. C.—Bids will be received by the Bureau of Engraving and Printing, Treasury Department, Washington, D. C., until March 22 to furnish electrical supplies, etc., during the fiscal year beginning July 1, 1909. Blank forms with specifications for proposals will be furnished on application to Joseph E. Ralph, director of bureau.

WASHINGTON, D. C.—Bids will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until Feb. 2 for furnishing at the various naval stations and navy yards the following supplies: Mare Island, Cal.: Schedule 794—A 3-hp motor and two 5-hp motors. Annapolis, Md.: Schedule 827—100 ft. twin conductor lighting wire and 3000 ft. single conductor lighting wire. Washington, D. C.: Schedule 832—Two duplex horizontal boiler feed pumps, cold rolled copper, hard sheet brass and 1000 lb. flexible G. I. wire hoisting rope, etc. Brooklyn, N. Y., and Camden, N. J.: Schedule 766—Ammunition hoists and electrical equipments. E. B. Rogers is paymaster general, U. S. N.

ATLANTA, GA.—The newly organized Piedmont Power Company has elected the following named directors: William L. Pell, David Woodward, William Nixon, J. S. B. Thompson, S. F. Parrott, Frederick J. Paxon, S. D. Jones, Albert Howell, Jr., and Louis B. Magie. The company proposes to transmit electricity to Atlanta for manufacturing purposes from hydro-electric plants to be constructed at outlying power sites.

EAST POINT, GA.—Contracts for the construction and equipment of the municipal electric light plant have been awarded as follows: For generator and other electrical equipment to the Westinghouse Electric & Manufacturing Company, of Pittsburgh, Pa.; for engine, to Hoover, Ewens & Rentschler Company, and to Sullivan & Long, of Bessemer, Ala., for construction of power house. Contract for pole line not yet awarded.

ELBERTON, GA.—An election will be held Feb. 16 to vote on the proposition to issue $5,000 in bonds, the proceeds to be used to increase the output of the municipal electric light plant.

HAWKINSVILLE, GA.—The Hawkinsville Cotton Mills have been purchased by J. C. Cooper for $65,000. The mill has an electric plant which furnishes electricity for lighting the streets of the town.

JACKSON, GA.—It is reported that surveys are being made some miles below the development of the Central Georgia Power Company, with a view to establishing another electric plant on the Ocmulgee River.

WILLACOOCHEE, GA.—It is reported that plans are being prepared for the construction of a municipal electric light plant in Willacoochee. J. B. McCrary & Company, of Atlanta, Ga., will have charge of construction of the plant.

LEWISTON, IDAHO.—A proposition has been submitted to the City Council by M. A. Keans, of Lewiston, to construct and operate a street railway system by local capital. The cost of the system is estimated at about $100,000. A company will be oroganized at once.

ANNA, ILL.—The Bell Telephone Company has secured control of the Ohio & Mississippi Telephone Company, through the purchase of the stock owned by Dr. F. W. Willard, of Anna.

CHICAGO, ILL.—The Federal Electric Company has increased its capital stock from $50,000 to $250,000.

DEKALB, ILL.—The Woodstock & Sycamore Traction Company has filed in the recorder's office in Dekalb, a deed of trust in favor of the Metropolitan Trust and Savings Bank, of Chicago, Ill., to secure a bond issue of $700,000, the proceeds to be used to complete the construction of the railway. The company is building an electric railway from Woodstock to Sycamore.

ELGIN, ILL.—The question of installing an ornamental street lighting system on Riverside Avenue in this city is under consideration.

HILLSBORO, ILL.—The capital stock of the Hillsboro Electric Light & Power Company has been increased from $50,000 to $100,000.

JOSLIN, ILL.—The Crescent Telephone Company has increased its capital stock from $2.000 to $20,000.

JASONVILLE, IND.—T. J. McGrew and others, of Coalmont, Ind., have been granted a franchise to build and operate a telephone plant in this city.

NORTH MANCHESTER, IND.—We are informed that the Browne-Mills Electric Company will install a 250-kw, three-phase alternator, direct connected to an Allis-Chalmers Corliss engine, in its plant next May. The company also proposes to establish a day service for power.

PETERSBURG, IND.—The Pike County Telephone Company has increased its capital stock from $40,000 to $50,000.

SHOALS, IND.—The Board of Trustees has granted a franchise to James F. Lynch, of Danville, to construct and operate an electric light plant in Shoals. The streets will be lighted by both arc and tungsten lamps. A meter will be system for residence and commercial lighting.

BELLEVUE, IA.—W. J. Fay, city clerk, writes that it is proposed to rebuild the municipal electric light plant at a cost of about $7,000. O. C. Hintz, of Bellevue, Ia., is engineer in charge.

COUNCIL BLUFFS, IA.—The Citizens' Gas & Electric Company has increased its capital stock from $250,000 to $350,000.

FORT MADISON, IA.—Arrangements have been completed by H. H. Masden, of this city, for the sale of the Northwestern and Salem lines ot the telephone system to John Saunders, of Houghton, the consideration being $16,000 and $7,500, respectively. These lines will be consolidated with the German-American lines owned by Mr. Saunders.

GRUNDY CENTER, IA.—The Iowa Construction Company has been granted a franchise to construct and operate street railway, electric light and power plant, gas and telegraph system in Grundy Center.

MASON CITY, IA.—The People's Gas & Electric Company is installing a 200-hp Skinner engine in its power plant.

OELWEIN, IA.—Plans are being considered by the Oelwein Light, Heat & Power Company for improvements to its plant during the coming year, which will involve an expenditure of about $25,000.

CHEROKEE, KAN.—The Joplin & Pittsburg Electric Railway Company has been granted a franchise by the City Council to construct and operate its railway in this city.

FOWLER, KAN.—Application has been made to the City Council for a franchise to install an electric light and ice plant in Fowler by R. B. Flesch & Company. The company proposes to erect a plant in the town to cost from $10,000 to $25,000.

LARNED, KAN.—The C. W. Smith Electric & Ice Company is planning to extend its transmission lines to small towns, which will require the erection of about 20 miles of lines.

McPHERSON, KAN.—The city has taken over the local water and electric light plants to be operated by the municipality. The price paid for the plant was $51,594. Eugene D. Meyers, of Wichita, Kan., has been engaged as superintendent. D. R. Maltby is chairman of the city commission.

PITTSBURG, KAN.—Negotiations are under way between the Girard Coal Belt Electric Railway Company, of Girard, Kan., and the Joplin and Pittsburg Electric Railway Company, by which the later will purchase the Coal Belt system. J. J. Heim is president of the Joplin & Pittsburg Electric Company.

BELLEVUE, KY.—The City Council has adopted plans submitted by City Engineer Hornung for the construction of a municipal electric light plant. The plans submitted call for a plant with sufficient output to supply electricity for 74 arc lamps and the necessary commercial lighting, the cost of which is estimated at $33,286. The cost of operating the plant would be about $11,000 per year.

PINEVILLE, KY.—The plant and holdings of the Pineville Light & Ice Company have been purchased by Frank Gibson and D. B. Logan, of Pineville, and Mr. Hale, of Knoxville, Tenn. The new owners will rebuild the plant, which was recently destroyed by fire.

LAFAYETTE, LA.—Charles J. Muller, superintendent of the municipal electric light plant, has submitted a recommendation to the City Council that the electric light system be changed from direct to alternating current.

BALTIMORE, MD.—Plans are being considered by the Park Board for making improvements at Patterson Park at a cost of about $20,000, which will include the installation of a lighting system at the bathing pool and on the athletic field, to cost about $4,500; the paving of the mall at a cost of $9,000; also lighting the mall and providing permanent seats, for which $5,000 of the annual appropriation will be used. Ferdinand C. Latrobe is president of the board.

BALTIMORE, MD.—Bids will be received at the office of the City Register, City Hall, Baltimore, Md., until Feb. 3 for the installation of an underground electric lighting system at Patterson Park. Plans and specifications can be seen and obtained at the office of the Park Board, Madison Avenue entrance to Druid Hill Park, Baltimore, Md. Copies of plans and specifications can be had for the lighting system by placing a deposit of $5. William S. Manning is general superintendent.

CAMBRIDGE, MD.—The Cambridge Light & Power Company, recently incorporated, has awarded contract for installation of plant to Wehr, Walden & Dukehart, of Baltimore, Md. The plant will have an output of about 200 kw. R. B. Fentress, of Norfolk, Va., and W. H. Medford, of Cambridge, Md., are interested in the project.

DENTON, MD.—Application has been made to the Town Council for a franchise by a company which contemplates the construction of an electric light plant in Denton.

BALDWINVILLE, MASS.—C. A. Smith, secretary of the municipal electric light plant at Templeton, writes that the Municipal Electric Light Board has re-elected Herbert G. Lowell superintendent and manager of the plant for another year.

BARRE, MASS.—A movement has been started toward the establishment of an electric lighting system for this town.

FRANKLIN, MASS.—The new substation has been completed and connected with the plant of the Woonsocket Electric Machine & Power Company, of Woonsocket, R. I., which will furnish electricity for operating the local system. The new system will soon be placed in operation when a 24-hour service will be given. The two arc lamp circuits will be operated by a motor in the old plant until the new lamps are installed.

SALEM, MASS.—Bids will be received until Feb. 1 by the County Commissioners for furnishing and putting in place electric fixtures for the registry of deeds and probate court house at Salem, Mass. Drawings and specifications are on file at the office of County Commissioners, Court House, Salem, Mass., and at the office of the architect, C. H. Blackall, 20 Beacon Street, Boston, Mass. Moody Kimball, James C. Poor and J. M. Grosvenor, Jr., are county commissioners.

UPTON, MASS.—J. Russell Robinson, president of the Upton Electric Company, is negotiating with the Selectmen for a franchise to furnish electricity in the town; also for a contract for street lighting. The town now pays about $800 per year for lighting the streets with oil lamps, and it is estimated that an incandescent electric lamp system can be installed to cost about $1,000 per year.

WELLESLEY, MASS.—The municipal light commissioners have announced a reduction in the price of electricity from lamps in Wellesley from 16 to 13 cents per kw-hour, the new rate to take effect immediately.

WORCESTER, MASS.—Plans have been completed by the local wire commission, consisting of Henry A. Knight, superintendent of wires, F. H. McClure, city engineer, and George C. Moss, street commissioner, of the section of the city in which the wires are to be placed underground this year.

ALMA, MICH.—The Union Telephone Company contemplates a reorganization so as to provide for an increase in capitalization to $1,837,000.

BIG RAPIDS, MICH.—The Board of Supervisors has passed a resolution appropriating $100 and for the appointment of two members to make investigations in regard to developing water power in the Muskegon River, to be used to generate electricity. The board is securing this information so as to be able to act intelligently when, in the near future, the Grand Rapids-Muskegon Power Company will ask for new franchises, the present franchise becoming void on April 1 because of non-compliance with its provisions.

DETROIT, MICH.—Announcement has been made that the Home Telephone Company is planning to extend its telephone lines in the outlying districts. The work will involve an expenditure of about $600,000.

KALAMAZOO, MICH.—The City Council has instructed the city engineer to prepare plans and estimates of the cost of a subway for electric light, telegraph and telephone lines to be constructed on each street to be paved this year.

MADISON LAKE, MINN.—The Commercial Club is considering the question of building an electric railway from Mankato to Madison Lake, later to be extended to Northfield. H. E. Nance, general manager of the Mankato Electric Traction Company, has submitted a proposition proposing that the railway be built by the way of St. Peter, Lakes Emily and Washington, with an estimate of the cost.

OWATONNA, MINN.—The Pratt Rural Telephone Company is planning to make extensions east and south during the coming year.

PINE CITY, MINN.—We are informed that J. M. Allen and R. P. Allen are interested in the construction of a 600-hp hydro-electric plant, with an eight-mile transmission line having a potential of 10,000 volts. Bids for the construction of the plant will be received about March 10. It is proposed to form a company under the name of the Pine City Power Company with a capital stock of $50,000 to operate the plant. J. M. Allen is engineer. The cost of the plant is estimated at $25,000.

THIEF RIVER, MINN.—Plans are being considered to construct a rural telephone line to Rainer, a distance of thirty miles.

CARTHAGE, MO.—Arrangements are being made by the Empire Electric Power & Supply Company to enlarge its power house; also the installation of additional equipment, including a motor generator and transformer.

ELDORADO SPRINGS, MO.—It is reported that the Eldorado Springs, Tiffin, Monegaw Springs and Lowry City Railroad Company will locate its power plant on Osage River. C. A. Edgar, of Eldorado Springs, is president.

KANSAS CITY, MO.—Final surveys have been completed for the proposed electric railway between Kansas City and Lone Jack by the Kansas City Southeastern Traction Company. The main railway will extend from Kansas City through Lone Jack, Warrensburg and Sedalia to Jefferson City, a distance of 125 miles. A branch line will be built from Lees Summit to Greenwood, Pleasant Hill and Harrisonville, 15 miles in length. Another branch will extend to Clinton. Charles A. S. Sims is president and J. C. Herring chief engineer. Electricity for operating the system will be furnished by the Metropolitan Street Railway Company, of Kansas City. The cost of the railway to Jefferson City is estimated at $5,000,000. It is proposed ultimately to extend the railway to St. Louis, Mo.

ST. LOUIS, MO.—Plans have been approved and an ordinance introduced in the Assembly for the proposed new pumping station, power house and water tower at the Insane Asylum, to cost about $70,000, including machinery.

ST. LOUIS, MO.—It is reported that the Laclede Gas Light Company contemplates extensive improvements and additions to its system,

which will involve an expenditure of about $10,000,000. Among the improvements contemplated is the construction of a new plant at Broadway and River des Peres.

ST. LOUIS, MO.—The Board of Public Improvements has granted the West End Light & Power Company permission to construct a conduit on Grand Avenue from Manchester Avenue to Lucky Street, to cost $80,000. The company is to operate under the old Browning-King franchise. It is said that the first power plant will be located in Mill Creek Valley, near Grand Avenue. Plans for the main underground conduit have been completed and plans for the power house will be ready within a short time.

MISSOULA, MONT.—The Misoula Light & Water Company contemplates enlarging its substation and the construction of a street railway system.

STEVENSVILLE, MONT.—The City Council has granted a franchise to C. D. McCarthy to construct an electric light plant in Stevensville.

ANTRIM, N. H.—The Goodell Company, owner of the local electric light plant, has decided to develop a water power at North Branch, about four miles from this village. A 500-kw generator will be installed. The company writes that about 500 hp will be developed, which will be more than the company requires at present, and it will probably have several hundred horse-power to sell. It is stated that the town is ready to vote liberal terms to industries that could be induced to locate in Antrim and utilize part of the surplus power. It is expected to install the plant during the coming summer. David H. Goodell is president.

CONWAY, N. H.—The citizens are considering the question of improving the present electric lighting system for both street and residential lighting, as the present service is inadequate and unsatisfactory. A committee has been appointed to make investigations with a view to improving conditions.

KEENE, N. H.—The Keene Electric Railway Company has made arrangements with the Keene Gas & Electric Company to furnish electricity to operate its railway to West Keene, Marlboro, Swansey and South Keene.

CEDARVILLE, N. J.—Arrangements are being made to light this town by electricity. The street lighting system will consist of 25 lamps.

ELIZABETH, N. J.—Plans are being considered for the construction of an electric railway from Elizabeth to Perth Amboy. The company will be known as the Elizabeth & Perth Amboy Traction Company. Charles A. Trimble, of Elizabeth, N. J., is one of the incorporators. J. A. McClary, of Rahway, N. J., has charge of the engineering work.

NEWARK, N. J.—The Board of Education is planning to install an independent lighting plant in the new Morton Street School at a cost of about $14,000. G. W. Knight is engineer of Board of Education.

PLAINFIELD, N. J.—Arrangements have been completed whereby electricity for consumers in Plainfield and South Plainfield will be furnished from the Cranford plant of the Public Service Corporation. The local generating station of the company will be held for use in emergencies. The equipment of the Cranford plant, which has recently been rebuilt, includes a turbine generator with a rating of 2000 hp, three new boilers, condensing apparatus, new switchboard and transformers.

SOUTH AMBOY, N. J.—Owing to the unsatisfactory electric lighting service given at present the Board of Trade is considering the advisability of securing electrical service from a large manufacturing plant in Sayreville, which is now furnishing electricity in South River, N. J.

BATH, N. Y.—The Citizens' Electric Service Company has been reorganized and Horace Jones elected president to succeed E. J. G. Towner, resigned. M. J. Burke, of Buffalo, N. Y., is the contractor to finish the plant. The land upon which the power house is being built has been paid for and operations will be resumed. The Village Trustees have given Mr. Burke until May 16 to finish the plant and assume the contract with the village for street lighting.

CLYDE, N. Y.—The Wayne County Electric Company has suspended its street lighting service in Clyde, for which various reasons have been given.

DANSVILLE, N. Y.—The Village Trustees are considering the question of improving the street lighting system in the village. The Dansville Gas & Electric Light Company has submitted a proposition offering to furnish an all-night service at $80 per lamp per year for arc lamps of 2000 cp and $18 each per year for incandescent lamps. The Akron Brass Company, of Akron, Ohio, offers to light the streets with gasoline or kerosene arc lamps, furnishing 60 lamps at $50 per lamp per year, with the understanding that at the end of five years the village would own the lamps.

GREECE (P. O. BARNARD), N. Y.—The Rochester Railway & Light Compayn, of Rochester, N. Y., has been granted permission by the Public Service Commission, Second District, to extend its electric light and gas service to this town.

KENMORE, N. Y.—The Village Board of Trustees has voted to revoke the franchise of the Frontier Telephone Company, and instructed the village attorney to institute proceedings against the company to compel it to remove its wires and poles from the village streets.

NEW YORK, N. Y.—Bids will be received by John F. Ahearn, president of the Borough of Manhattan, City Hall, New York, N. Y., until Feb. 3 for the completion of the electric wiring system at the City Hall. The bidder is to state one aggregate price for the whole work described. Blank forms and information may be obtained at the office of the architect, Charles L. Eidlitz, 1128 Broadway, New York City.

NEW YORK, N. Y.—Bids will be received by John W. Brannan, president of the Board of Trustees of Bellevue and Allied Hospitals, Twenty-sixth Street and First Avenue, New York, N. Y., for furnishing and setting electric lighting fixtures in training school for women nurses. Blank forms may be obtained at the office of the contract clerk, 419 East Twenty-sixth Street, New York, N. Y., where bids and deposits are to be delivered.

OLEAN, N. Y.—One of the proposed amendments of the city charter will empower the city to compel all telegraph, telephone and electric power companies to place their wires in underground conduits in Olean.

ROCHESTER, N. Y.—The Rochester Railway & Light Company has entered into a contract with the Bausch & Lomb Optical Company to furnish electricity for lamps and motors and also steam heat for its large plant on St. Paul Street, in this city. The optical company will require 1500 hp when the new addition to its plant is completed. Plans are now under consideration by the Rochester Railway & Light Company for the construction of a substation to be erected at Vincent and Gas Streets to furnish service to the optical plant and other interests in that vicinity.

ASHEVILLE, N. C.—The electric lines and equipment of the Biltmore estate of George W. Vanderbilt have been sold to the Asheville Electric Company. C. E. Waddell will remain in charge of the Biltmore interests supplying electricity for lamps and motors to the Biltmore House, the village, Kenilworth Inn, etc. Extensions and improvements are contemplated which will involve an expenditure of more than $100,000 during the present year.

CHARLOTTE, N. C.—What looks like a rate war has been instituted in Charlotte by the Southern Power Company, which a few days ago offered electricity to new patrons free for six months and a 25 per cent reduction to old patrons for the first four months of 1909. The Charlotte Electric Railway, Light & Power Company shortly afterward followed suit, and users of electricity for lamps are reveling in low rates.

CHARLOTTE, N. C.—The Westinghouse Electric & Manufacturing Company, of Pittsburgh, Pa., has secured the contract to furnish the electrical equipment of the Springstein and Eureka Mills, of Chester, S. C., and the Lancaster Mills, Nos. 1 and 2, controlled by Col. Leroy Springs. The equipment will include a large number of electric motors consisting of about 3000 hp in various sizes. The General Electric Company has secured the contract for the equipment of the substation to be established in Lancaster. Contracts have been placed with the Southern Power Company, of Charlotte, N. C., to furnish electricity to operate the mills.

GREENSBORO, N. C.—The Southern Power Company contemplates extending its transmission lines to High Point, to furnish electricity for numerous woodworking plants located in that town, and will extend the lines to Greensboro.

HURDLE MILLS, N. C.—Dr. J. I. Coleman, of Hurdle Mills, is considering the purchase of a dynamo to furnish electricity for 100 lamps.

SALISBURY, N. C.—The Piedmont Carolina Power Company is building a new transmission line in Salisbury, and will later extend the lines into suburban sections, using electricity supplied by the Southern Power Company.

DICKINSON, N. D.—Plans are being considered by A. H. Deiters and B. Davis, owners of the local electric light plant, for the construction of an addition to their power plant and the installation of two more boilers.

BUCYRUS, OHIO.—The United States Circuit Court has reinstated the injunction, which the Common Pleas Court dismissed recently, restraining the city from issuing $90,000 in bonds for the construction of a municipal electric light plant. The City Council is advertising for bids for furnishing electricity for lamps and motors for both city and commercial purposes. It is said that if a satisfactory bid is received a contract will be made and the propositon to construct a municipal plant abandoned.

CAMBRIDGE, OHIO.—The special committee appointed to investigate the question of constructing a municipal electric light plant, in its report submitted to the City Council estimates that the cost of installing the plant will be about $30,000 and the cost of maintaining the same about $6,000 per year.

CINCINNATI, OHIO.—The Park Commission and Superintendent Rodgers are considering the question of installing a new system for lighting the parks in this city.

CINCINNATI, OHIO.—It is reported that the Cincinnati Gas & Electric Company has secured the control of the Union Gas & Electric Company, of Cincinnati. The Cincinnati Gas & Electric Company is said to have had large holdings in the Union company since its organization, but did not have control.

COLUMBUS, OHIO.—Arrangements are being made to extend the municipal arc lighting system. It is proposed to install arches on Broad Street to Memorial Hall.

COLUMBUS, OHIO.—Plans are being considered to have the municipal electric light plant furnish electricity to light the arches on High Street. At present the business men are paying a private corporation $40 per month for the service. In the annual report to be submitted by H. Gamper, superintendent of the municipal electric light plant, to the

City Council he will recommend that electricity to light the City Hall, Board of Education Building, public library, city prison and arches in the business district be furnished from the municipal plant. If it is decided to do this it will be necessary to erect a new transmission line from the plant, the cost of which is estimated at $3,000. At present the city pays a private corporation to light the City Hall and other buildings.

SANDUSKY, OHIO.—It is reported that the power house of the Lake Shore Electric Railway Company, located in this city, is to be converted into a car building and repair shop.

STOCKPORT, OHIO.—The capital stock of the Morgan County Farmers' Telephone Company has been increased from $5,000 to $30,000.

TIPPECANOE CITY, OHIO.—The capital stock of the Tipp Interurban Telephone Company has been increased from $30,000 to $40,000.

WARREN, OHIO.—The Warren Water & Light Company contemplates changing its system to three-phase, 60 cycles and increasing the output of its plant. C. E. Inman is superintendent.

SULPHUR, OKLA.—It is reported that the Sulphur Light Company has purchased the local lighting plant and will make improvements to same. The company is said to be considering the construction of a hydro-electric plant. C. I. Paterson, of Magnum, Okla., is president; E. E. Preston, vice-president, and J. F. McKeal, of Ada, Okla., secretary and treasurer.

BEND, ORE.—It is reported that A. M. Drake, who recently filed an appropriation of the waters of the Deschutes River, contemplates the construction of a dam and power house on the river just north of the site of the old bunkhouse in Bend.

EUGENE, ORE.—Application has been made to the County Commissioners by J. Rodman, F. E. Dunn, Alton Hampton, George Melvin Miller and others for a franchise to construct an electric railway from Eugene to Florence at the mouth of Siuslaw River.

EUGENE, ORE.—Contracts have been awarded by the City Council for electrical equipment for the municipal electric power plant as follows: To the Portland Machinery Company, for electric machinery, for $11,512; for turbine water wheels, to the Pelton Water Wheel Company, of San Francisco, Cal., for $19,800. The contracts call for machinery capable of generating 1200 hp.

MARSHFIELD, ORE.—John Marsden, of Marshfield, Ore., has filed a notice of appropriation of 9600 cu. in. of water from Loon Lake and Mill Creek, to be utilized for hydro-electric power purposes.

ROSEBURG, ORE.—Plans are being considered by S. A. Kendall, of Pittsburg, Pa., one of the owners of the local electric light plant, for improving the water and light systems in this city. It is proposed to install a new plant about half a mile below the present plant at Winchester, four miles from Roseburg. The power house now in use will be used as a pumping station. The new plant will have an output sufficient to supply 20,000 lamps, about double the output of the present plant. Both the light and water service will be extended to Edenbower.

UNION, ORE.—The citizens are considering the question of establishing a municipal electric light plant in Union.

PANAMA.—Bids will be received at the office of the general purchasing officer of the Isthmian Canal Commission, Washington, D. C., until Feb. 8 for furnishing condenser tubes, switchboard and electrical attachments, wire, wire rope clips, etc. Blanks and general information relating to this circular (No. 490) may be obtained from the above office and the office of the assistant purchasing agents, 24 State Street, New York, N. Y.; Custom House, New Orleans, La., and 1086 North Point Street, San Francisco, Cal. Captain F. C. Boggs is general purchasing officer.

HARRISBURG, PA.—Charters have been granted by the State Department to five electric companies for townships in Huntingdon County, to be located in the following named towns: Wayne, Granville, Union, Brady and Henderson. Each company is capitalized at $5,000, and the incorporators are: Harry F. Ambler, J. C. Moorehead and Daniel McAlnin. Electricity for operating the systems is to be supplied from some of the large hydro-electric plants.

LANCASTER, PA.—Negotiations have been completed by the Susquehanna Railway & Light Company whereby the company acquires the property and franchise of the Philadelphia, Coatesville & Lancaster Railroad Company. The price paid is said to be $137,500.

PHILADELPHIA, PA.—The Spreckles Sugar Refining Company has been granted a permit to erect a power house at the corner of Dickinson and Meadow Streets, to cost $5,000.

PITTSBURGH, PA.—The Westinghouse Electric & Manufacturing Company has been awarded a contract by the city of Pittsburgh for 1200 flaming arc lamps, at a cost of $60,000. The lamps will be used on the north side in connection with the municipal electric light plant.

SUNBURY, PA.—Contracts have been placed by the Middle Creek Electric Company for machinery for its new plant, which will be located on the old nail mill site in Sunbury. The electrical machinery and dynamos will be furnished by the Fort Wayne Electric Works, Fort Wayne, Ind. The plant will furnish electricity to operate the Sunbury & Selinsgrove Street Railway and for commercial lighting.

PROVIDENCE, R. I.—The power plant of the Scituate Electric Light & Power Company has been put in operation and is furnishing electricity to operate several manufacturing plants in Scituate, also for the Clayville Mills.

PROVIDENCE, R. I.—Plans have been completed for the construction of a new power plant to be built on the property of the Atlantic Mills in Olneyville to furnish electricity to operate the mills. A contract has been awarded for a 1500-kw Westinghouse-Parsons steam turbine. The plant will have an output of 8000 hp.

CHESTER, S. C.—Arrangements are being made by the Chester Telephone Company to begin work on the construction of an underground cable system in the business section of the city. It also proposes to extend its overhead cable system.

CHESTER, S. C.—This town will shortly be lighted by electricity transmitted from the plant of the Southern Power Company at Great Falls, 23 miles distant. The company will also furnish electricity to operate a number of cotton mills in Chester.

LAURENS, S. C.—A new power plant on Reedy River, owned by N. B. Dial, eight miles distant, has been put in operation and is now supplying electricity for lamps and motors in Laurens. The plant has an output of 2000 hp.

RAMONA, S. D.—The question of establishing an electric light plant in Ramona is under consideration.

BINGHAMTON, TENN.—An election will be held Feb. 11 to vote on the proposition to issue $25,000 in bonds for the construction of an electric light plant, sewer system and water works. The equipment for electric plant will include a steam electric generating unit, to cost $4,000; material and erection of transmission lines, at a cost of $1,600; arc lamps, $300, and power station, $1,000.

KNOXVILLE, TENN.—Estimates are being made by John W. Flenniken, chairman of board of public works, of the cost of installing a generator in the Commerce Avenue fire station to furnish electricity to light the fire station, police headquarters and market house.

MEMPHIS, TENN.—A permit has been issued to the Merchants' Power Company to erect an addition to its plant, located on Keel avenue, to cost $20,000.

MONTEREY, TENN.—Plans are being considered to establish a municipal lighting plant in Monterey. For further information address the city clerk.

BEAUMONT, TEX.—At the annual meeting of the Beaumont Ice, Light & Refrigerating Company a committee was appointed to investigate its plant and system and report to the directors what improvements and additions are necessary. Kyle Ward is secretary.

BRADY, TEX.—The Brady Water & Light Company contemplates the complete rewiring and reconstruction of its system. J. H. White is president and manager.

BRYAN, TEX.—An election will be held to vote on the proposition to issue $75,000 in bonds, the proceeds to be used for the construction of an electric light plant, sewer system and water works. J. T. Maloney is Mayor.

DALLAS, TEX.—An association has been organized by the citizens of East Dallas to secure improvements to that section of the city, which will include the installation of electric street lamps, extension of water system, etc. W. A. Russell is chairman.

DENTON, TEX.—Application has been made to the Town Commissioners by Thomas F. Garey, 1004 McCulloh Street, Baltimore, Md., for a franchise to operate an electric light system in Denton. It is proposed to develop water power at Spring Mills and transmit electricity to Denton, a distance of about two miles.

GALVESTON, TEX.—The Galveston Electric Company has applied to the City Council for permission to double track its railway to the city limits on Broadway and on Avenue R.

TERRELL, TEX.—Bids will be received until about Feb. 10 for the construction of a municipal electric light plant, which will include the erection of a power house at a cost of $2,000 and installation of steam and electrical machinery to cost $15,000. Specifications furnished on application. W. C. Drake is engineer in charge of the work. The plant is to be operated in connection with the water works system.

VAN VLECK, TEX.—Plans are being considered to erect an electric and refrigerating plant, with sufficient output to supply a town of 5000 inhabitants. L. W. Trumbull is promoter of the project.

EPHRAIM, UTAH.—The City Council is considering the question of discarding flat rates in connection with the municipal electric light plant and installing meters.

SALT LAKE CITY, UTAH.—Plans are being considered by Louis C. Kelsey, city engineer, for changing the street lighting system on Main Street between South Temple and Fourth South Streets.

VERGENNES, VT.—The city of Vergennes, Vt., has applied to the State Legislature for permission to amend its charter authorizing the city to issue bonds to the amount of $15,000 for the construction of a municipal electric light plant.

WALLINGFORD, VT.—The citizens have voted to enter into a contract with the Rutland Railway, Light & Power Company to furnish electricity to light the streets of the village. The company is to furnish 30 incandescent lamps of 40 cp.

BOWLING GREEN, VA.—The capital stock of the Carolina County Telephone Company has been increased from $10,000 to $15,000.

LYNCHBURG, VA.—Plans are contemplated for the construction of a large hydro-electric power plant on Staunton River at Puckett's Falls, where it is estimated that 5000 hp can be developed, for transmission to Lynchburg, Va. The cost of the plant is estimated at $650,000.

MEHERRIN, VA.—The Lunenburg Telephone Company has decided to make several extensions to its telephone lines and also improvements to its exchanges.

RICHMOND, VA.—The Carolina County Telephone Company has been granted permission by the State Corporation Commission to increase its capital stock from $10,000 to $15,000.

RICHMOND, VA.—The City Council has directed the committee on electricity to secure the services of an expert electrical and hydraulic engineer to review the plans and estimates of Edward W. Trafford, engineer for the municipal electric light plant, for which an appropriation of $1,000 was made.

SOUTH HILL, VA.—The City Council has granted a franchise to the South Hill Manufacturing Company to operate an electric light system in South Hill. A franchise was also granted to Norbourne G. Smith to install a local telephone exchange. Both plants are expected to be in operation in March.

BELLINGHAM, WASH.—The City Council has granted the Bellingham Bay & British Columbia Railway Company a franchise over streets leading around the water front, with provision that the company must make application within thirty days to the War Department for permission to cross Whatcom and Squalicum Creeks.

CASHMERE, WASH.—The Valley Power Company is planing to increase the output of its plant from 300 hp to 1000 hp. The cost of the work is estimated at $125,000.

CONCULLY, WASH.—Plans are being made by the Concully Copper Mining Company to install an electric plant to furnish electricity to operate its mining machinery. The company will also furnish electricity to the public for lamps and motors.

FAIRFIELD, WASH.—The City Council has granted a franchise to the Nixon-Kimmel Company to construct and maintain transmission lines for the distribution of electricity in Fairfield for lamps, heat, motor and other purposes.

NEWPORT, WASH.—Plans are being made by the Newport Telephone Company to construct a telephone line from Newport to the Metaline country. It is proposed to connect all construction camps along the Idaho & Washington Northern extension with the local office and the Pacific States and the Interstate telephone lines at Spokane.

SEATLE, WASH.—The Capitol Hill Improvement Club is endeavoring to secure electric lighting service in the Capitol Hill district.

SPOKANE, WASH.—Application has been made to the County Commissioners by Denton M. Crow for a franchise to erect a transmission line for a distance of about twenty-three miles for light, heat, power and telephone service. Electricity for the line will be taken from the Evergreen station of the Inland system.

SPOKANE, WASH.—Plans are being made by the Washington Water Power Company for extensive improvements and extensions to its system during the coming year, which will involve an expenditure of about $3,000,000 and will include the purchase of equipment, enlargement of distributing stations, underground work and the erection of new substations on the interurban railways. The company proposes to erect a power plant at Little Falls at a cost of $750,000. Two 1500-kw motor-generator sets will be installed at the steam power plant at Cheney, where a substation and motor-generator station will also be erected; some additions are to be made to the substation at Post Falls. Additions will be made to the Twenty-ninth Avenue substation and two 3000-kw transformers installed and additional tie-lines will be erected between the power stations. The equipment will also include the purchase of 30 new cars.

TACOMA, WASH.—The City Council is considering the proposition to construct a 3000-hp steam plant, to be used as an auxiliary for the overload until the new hydro-electric plant on the upper Nisqually River is completed. The Seattle-Tacoma Company has notified the Commissioner of Public Works that the company will not be able to furnish the city any electricity above the 6000 hp contracted for after April, 1909. The Council is also considering the question of securing the services of a competent engineer to supervise the construction of the power plant on the upper Nisqually River.

WILLIAMSON, W. VA.—Arrangements are being made by the Norfolk & Western Railway Company to construct a power house at Williamson. C. S. Churchill, of Roanoke, Va., is chief engineer.

DODGEVILLE, WIS.—The City Council is considering the question of installing a municipal electric light plant to furnish electricity for street lighting and commercial service.

GLENWOOD, WIS.—The Western Wisconsin Telephone Company has increased its capital stock from $12,000 to $20,000.

KENOSHA, WIS.—A committee has been appointed by the City Council to secure estimates on the cost of constructing a municipal electric light plant.

LA CROSSE, WIS.—Plans for the construction of a municipal electric light plant are being prepared by Jacob Cloos, engineer.

MELLEN, WIS.—The capital stock of the Mellen Water & Light Company has been increased from $15,000 to $50,000.

MILWAUKEE, WIS.—The State Railway Commission has granted the Milwaukee Electric Railway & Light Company a certificate of necessity and convenience, authorizing the proposed extension of its railway from Wauwatosa to Oconomowoc, via Elm Grove and the northern shores of Oconomowoc Lakes. Work will be commenced on the proposed railway next summer. John I. Beggs is president of the company.

MILTON JUNCTION, WIS.—It is reported that the Janesville Electric Company contemplates furnishing electrical service in Milton Junction.

OCONOMOWOC, WIS.—The City Council has decided to enlarge and improve the municipal electric light plant, for which an appropriation of $11,000 has been made.

OSHKOSH, WIS.—Contracts amounting to more than $1,000,000 have been awarded by the Northern Hydo-Electric Company for the construction of its hydro-electric plant at High Falls, on the Peshtigo River. The contract for construction of power house and dam was given to the Bates-Rogers Construction Company, of Chicago, Ill.; for steel towers, to the Aermotor Company, of Chicago, Ill.; to the John A. Roebling Sons' Company, of Trenton, N. J., for copper wire; for turbines and generators, to the Allis-Chalmers Company, of Milwaukee, Wis., and to the Sandusky Portland Cement Company, for cement.

WEST ALLIS, WIS.—The West Allis Light & Power Company has applied to the City Council for a franchise to construct electric light and gas plants in this city.

MEETEESE, WYO.—A franchise has been granted to Fred C. Schaub, of Cody, Wyo., to construct and operate an electric light and power plant in Meeteese. The plant will be operated by water power from the Greybull River. Mr. Schaub is in the market for machinery and electrical equipment.

WINNIPEG, MAN., CAN.—The Provincial Department of Telephone has been abolished by the Manitoba government. In future the management of the government telephone system will be undertaken by the Manitoba Government Telephone Commission.

WINNIPEG, MAN., CAN.—The City Council has ignored the proposition of the Winnipeg Street Railway Company to sell its entire plant to the city for $16,000,000, and, to avoid possible injunction proceedings, has signed contracts for the completion of the city power plant, which will involve an expenditure of $6,000,000. The street railway company as an ultimatum offered to reduce the price of electricity for lamps and motors to local consumers 20 per cent below the present schedule and to sell all the power the city might require for retail purposes at $24.60 per hp-year.

TORONTO, ONT., CAN.—Plans for the distribution system in connection with the municipal lighting plant are well under way, and it is expected that bids will be advertised for underground cables within 30 days. The cost of the first installation is estimated at $50,000. The Hydro-Electric Power Commission is expected to be in a position to furnish electricity to the city by next December. K. L. Aitken, city electrician, has been instructed to take charge of the electric light plant in East Toronto, which will become the property of the city under the terms of the annexation agreement. The plant has an output of about 200 hp and serves about 100 customers.

EMARD, QUE., CAN.—The St. Paul Electric Light & Power Company has purchased the plant and holdings owned by L. J. Marchaud, which gives the company the privilege of supplying electricity for lamps and motors all over the Island of Montreal. The franchise also gives the company an exclusive franchise in the town of Emard for a term of 30 years. The St. Paul Electric Light & Power Company also contemplates extensive extensions to its system. F. Sevinny is superintendent.

MELVILLE, SASK., CAN.—A company is being organized here to construct an electric lighting plant; also to build a telephone system. For further information address Leon Benoit.

SWIFT CURRENT, SASK., CAN.—A franchise to construct an electric light and power plant has been granted to F. W. Laidley, of this city.

MEXICO CITY, MEX.—The Mexican Light & Power Company in a report submitted to its stockholders by Edward Clouston, president of the company, states that owing to the great and unexpected demand for electrical service that it has been decided to double the output of the hydro-electric plant at Necaxa, and to develop other water rights granted to the company by the Federal Government.

Company Elections.

WASHINGTON, D. C.—At the annual meeting of the Washington Railway & Electric Company the following named directors were elected: Milton E. Ailes, Charles J. Bell, Woodbury Blair, George H. Harries, W. P. Hibbs, William Loeb, Jr., Clarence F. Norment, Ward Thoron and George Treisdell. The same board of directors was chosen for the Potomac Electric Light Company.

CLINTON, IA.—At the annual meeting of the Clinton Gas Light & Coke Company the following officers were elected: G. E. Lamb, president; W. J. Young, Jr., vice-president; F. W. Ellis, secretary; C. B. Mills, treasurer, and Thomas Crawford, general manager.

TRAVERSE CITY, MICH.—At the annual meeting of the Manistee River Power Company the following officers were elected: Lavern S. Haskins, president; Lieut. P. Haskins and Stephen Lautner, vice-presidents; William Umler, secretary, and Anton W. Bartak, treasurer.

ST. LOUIS, MO.—At the annual meeting of the Laclede Gas Light Company the following named directors were elected: John I. Beggs, of Milwaukee, Wis.; C. W. Wetmore, of New York, N. Y.; James Campbell, Murray Carleton, August Gehner, Charles H. Huttig, Thomas H. West, David R. Calhoun and James E. Smith, all of St. Louis, Mo.

ANTRIM, N. H.—At the annual meeting of the Goodell Company, owner of the Antrim electric light plant, the following named officers were elected: David H. Goodell, president and treasurer; R. C. Goodell, vice-president; Henry A. Hurlin, clerk.

DERRY, N. H.—At the annual meeting of the Derry Electric Light Company the following named directors were elected: Greenleaf K. Barlett, Frederick J. Shepard, Joseph K. Barlett, Frank A. Hardy, Charles Barlett, Warren P. Horne and Benjamin T. Barlett. The directors elected G. K. Barlett, president; F. J. Shepard, treasurer, and J. B. Barlett, manager.

ROCHESTER, N. Y.—At the annual meeting of the American Telephone Company the following named officers were elected: James S. Brailey, of Urbana, Ohio, president; Charles H. Marvin, of Urbana, Ohio, vice-president, and C. D. Juvenal, of Urbana, Ohio, secretary.

ROCHESTER, N. Y.—At a meeting of the board of directors of the Rochester Railway & Light Company, held recently, Robert M. Searle, general manager, was elected vice-president, and Assistant General Manager. J. T. Hutchings was appointed general manager to succeed Mr. Searle.

SCHENECTADY, N. Y.—At the annual meeting of the Edison General Electric Company the old board of directors was re-elected as follows: Gordon Abbott, Oliver Ames, C. A. Coffin, W. M. Crane, T. Jefferson Coolidge, Jr., Frederick P. Fish, George P. Gardner, Henry L. Higginson, J. Pierpont Morgan, J. P. Ord, Robert Treat Paine, 2d., Marsden J. Perry, E. W. Rice, Jr., Charles Steele and S. L. Schoonmaker.

BRADFORD, PA.—At the annual meeting of the Bradford Electric Light & Power Company, held recently, the following named officers were elected: George H. Potter, president; D. W. Robertson, vice-president, and J. Harvey Rose, secretary and general manager.

HANOVER, PA.—At the annual meeting of the Hanover Light, Heat & Power Company the following named directors were elected: W. H. Lanius, J. W. Steacy, George P. Smyser, George S. Bilmeyer, T. J. O'Neill, W. D. Himes and Ellis S. Lewis.

BEAUMONT, TEX.—At the annual meeting of the Beaumont Ice, Light & Refrigerating Company the following named officers were elected: Joseph E. Carroll, president; M. K. Fletcher, vice-president; Kyle Ward, secretary, and W. S. Davidson, treasurer.

SHERBROOKE, QUE., CAN.—The following officers were elected at the annual meeting of the Sherbrooke Electric Street Railway Company: P. W. Clement, of Rutland, Vt., vice-president; R. Denio, of Windsor, Vt., manager; H. R. Barney, of Rutland, Vt., secretary and treasurer.

New Industrial Companies.

THE ELECTRIC HOME SPECIALTY COMPANY, of Oklahoma City, Okla., has been chartered, with a capital stock of $5,000, by Otto W. Hauck, E. Nix and C. P. Walker.

THE RAILWAY TELEPHONE & ELECTRICAL COMPANY, of Chicago, Ill., has been incorporated by Max W. Zabel to manufacture and sell railway, electrical and telephone supplies.

ESSER & ROTH have been incorporated, with a capital stock of $2,000, by John F. Esser, F. E. Roth and G. Q. Dean, all of New York, N. Y. The company proposes to do electrical work of all kinds.

THE STORRS BROTHERS ELECTRIC COMPANY, of Enid, Okla., has been incorporated, with a capital stock of $5,000, to carry on electrical contracting business, by William J. Krieder, Henry B. and George Storrs.

THE FALZER ELECTRIC COMPANY, of Chicago, Ill., has filed articles of incorporation, with a capital stock of $2,500, and proposes to deal in electrical goods. The incorporators are Clarence J. Silber and M. Filbrandt.

THE STANDARD GAS & ELECTRIC FIXTURE COMPANY, of Chicago, Ill., has been chartered, with a capital stock of $5,000, to manufacture gas and electric fixtures by David Broutman, Louis Vogelhut and Samuel Solomon.

THE FORT WAYNE ENGINE COMPANY, of Fort Wayne, Ind., has been incorporated to establish a plant to manufacture engines and machinery, with a capital stock of $50,000, by J. M. Geiger, E. F. Perry and J. Y. Shoaff.

THE SIEMAN'S MAGNETO COMPANY, of New York, N. Y., has been incorporated, with a capital stock of $50,000, by Frank Nebel, Joseph Butner and Sidney S. Meyers, all of New York, N. Y. The company proposes to manufacture electrical machinery.

NEILSON BROTHERS, of New York, N. Y., have been incorporated, with a capital stock of $5,000, to manufacture electrical fixtures and apparatus. The incorporators are Robert Neilson, David Murray and Benjamin Klinger, all of New York, N. Y.

THE U. S. COAL SAVER & SMOKE CONSUMER COMPANY, of Augusta, Maine, has filed articles of incorporation, with a capital stock of $1,000,000, to manufacture and sell smoke-saving devices. J. Berry, of Augusta, Maine, is president and treasurer.

THE B. & H. SPECIALTY COMPANY, of New York, N. Y., has been chartered, with a capital stock of $10,000, by Virginia C. Betts, L. Betts Hengerer, James H. Betts, all of New York, N. Y., to manufacture electrical and other advertising signs.

THE ARNOLD WEATHERBEE ELECTRICAL COMPANY, of Oklahoma City, Okla., has been incorporated, with a capital stock of $50,000, by W. H. Weatherbee, G. S. Moore and S. W. Van Hess. The company proposes to manufacture gas and electrical supplies.

THE LIVINGSTON & VAN EPPS COMPANY, of Syracuse, N. Y., has been chartered, with a capital stock of $5,000, to manufacture engines, machinery, motor cars, etc. The incorporators are Thomas E. Lambach, Burton B. Parsons and Emery P. Van Epps, all of Syracuse, N. Y.

THE COMMERCIAL TRUCK COMPANY, of New York, N. Y., has been chartered, with a capital stock of $10,000, by C. Q. Dean, Fred Knowlton and F. R. Marks, all of New York, N. Y. The company proposes to manufacture motors, engines, machinery, cars, vehicles, etc.

THE INTERCONTINENTAL ENGINEERING COMPANY, of New York, N. Y., has been incorporated, with a capital stock of $10,000, by John R. Putnam, Charlotte R. Putnam and Reginald Traulschold, all of New York, N. Y., to carry on an engineering and contracting business.

THE I. M. AUSTIN COMPANY, of Portchester, N. Y., has filed articles of incorporation, with a capital stock of $5,000, by Irving M. Austin, David T. Studwell, Katherine E. Austin and Ada L. Studwell, all of Portchester, N. Y. The company proposes to do general electrical work.

THE NATIONAL MACHINE RECORDER COMPANY, of Augusta, Maine, has been chartered, with a capital stock of $2,000,000, to manufacture mechanical and electrical appliances. The officers are: J. Berry, president and treasurer, and L. A. Burleigh, clerk, both of Augusta, Maine.

THE R. H. HOWES CONSTRUCTION COMPANY, of New York, N. Y., has been incorporated, with a capital stock of $50,000, by R. H. Howes, H. C. Howes and W. J. Coon, of New York, N. Y. The company proposes to do a general contracting, engineering and construction business.

THE RELIANCE ELECTRIC INSPECTION COMPANY, of New York, N. Y., has been chartered, with a capital stock of $5,000, by George L. Fairchild, M. G. Fairfield, Charles Wertheim and B. M. Wertheim, all of Brooklyn, N. Y. The company proposes to manufacture mechanical devices.

THE WINSUNPAC MANUFACTURING COMPANY, of New York, N. Y., has been chartered, with a capital stock of $25,000, to manufacture automatic, magnetic and electric signs and devices for advertising, etc. The incorporators are G. Q. Dean, F. Knowlton and P. K. Stauff, all of New York, N. Y.

THE WELCH-FORRESTER COMPANY, of New York, N. Y., has filed articles of incorporation, with a capital stock of $25,000, to manufacture motors, engines, machinery, vehicles, etc. The incorporators are: A. R. Welch, of Pontiac, Mich.; Allen P. Hallett and Mark M. Solomon, of New York, N. Y.

DUCAS & COMPANY, of New York, N. Y., have been incorporated by Herbert L. Schlesinger, Charles Ducas, Barnet and L. Hollander, all of New York, N. Y. The company is capitalized at $20,000, and proposes to import and export machinery and mechanical apparatus and deal in machinery and hardware.

THE COMBINATION SWITCH LOCK COMPANY, of Buffalo, N. Y., has been incorporated, with a capital stock of $500, by Oliver B. Thompson, George L. Kingston, Harry O. Kingston, of Buffalo, N. Y., and Henry G. White, of Lockport, N. Y. The company proposes to take contracts for electrical work.

THE ST. LOUIS STORAGE BATTERY COMPANY, of St. Louis, Mo., has been incorporated, with a capital stock of $200,000, to manufacture a patented storage battery and other electrical devices. George S. Tourville is president and treasurer; Oscar A. Morgner, secretary, and John Stirlen, general manager.

THE INTERVALE ELECTRIC COMPANY, of Yonkers, N. Y., has been incorporated, with a capital stock of $5,000, by Edward R. Plummer, George A. Waterman, of Yonkers, N. Y., and H. Du Bois Plummer, of New York, N. Y. The company proposes to do a general contracting and electrical engineering business.

THE W. H. STAVENHAGEN COMPANY, of Union, N. J., has filed articles of incorporation, with a capital stock of $10,000, by Wilhelm H. Stavenhagen, of Weehawken, N. J.; Byron L. Strasburger and Albert Pretzfelder, both of New York, N. Y. The company proposes to manufacture lamps, gas and electric light fixtures.

THE MOTOR APPLIANCE COMPANY OF AMERICA, of Perth Amboy, N. J., has been chartered, with a capital stock of $25,000, to manufacture machinery, mechanical devices and engineering appliances. The incorporators are: Joseph P. Hall, of New York, N. Y.; Albert S. DeVeau, of Brooklyn, N. Y., and Clarence C. Sibley, of Perth Amboy, N. J.

HUMPHREYS & GLASGOW, of New York, N.Y., have filed articles of incorporation with the Secretary of State, with a capital stock of $100,000, for the purpose of carrying on a civil, mechanical, gas and electrical engineering business. The incorporators are: A. C. Humphreys, of Morristown, N. J.; E. Guillauden, of New York, N. Y., and W. W. Randolph, of East Orange, N. J.

THE TELEPHONE SPECIALTY COMPANY, of Rochester, N. Y., has filed articles of incorporation with the Secretary of State. The company is capitalized at $10,000, and proposes to manufacture telephone and telegraph apparatus, and to do a general electrical and engineering busi-

ness. The incorporators are B. B. Clark, Robert H. Parks and John J. McInerney, of Rochester, N. Y.

THE AMERICAN BLOWER COMPANY, of Green Island, N. Y., has been incorporated, with a capital stock of $1,500,000, to manufacture fans, blowers, pumps, ventilating apparatus, engines, motors and machinery. The incorporators are: Norman A. Robertson, of Brooklyn, N. Y.; Charles H. Gifford, of Dedham, Mass.; Clayton W. Old, Thomas F. Wallace, of New York, N. Y., and Eugene V. Myers, of East Orange, N. J.

New Incorporations.

JACKSONVILLE, ALA.—Articles of incorporation have been filed for the Calhoun Light & Power Company with a capital stock of $5,000 by O. H. Herring, H. R. Rice and John P. Burk.

HELENA, ARK.—Articles of incorporation have been filed for the Helena Street & Interurban Railroad Company with a capital stock of $25,000. The officers of the company are: J. W. Burke, Jr., president; J. M. Vineyard, secretary and treasurer.

CHICAGO, ILL.—The Mount Hope Traction Company has been incorporated with a capital stock of $1,000 for the purpose of operating street railways. The incorporators are: Samuel P. Parmly, Jr., T. Hood Little and Victor E. Lind.

STERLING, ILL.—The Rock River Power Company has been incorporated with a capital stock of $78,000 by John H. Lawrence, Elmer Crawford and Harry H. Wood. The company proposes to develop and sell water power and electricity.

JAMESTOWN, IND.—The People's Co-operative Telephone Company has been incorporated to construct and operate a telephone system in Jamestown. George W. Pearson is president.

HARMONY, IND.—The Harmony Telephone Company has been incorporated with a capital stock of $150 to operate a mutual telephone system in Clay and Putnam Counties. The directors are: Martin J. Stroble, Charles Rabb, William H. Nagle, Lewis Englehart, David W. Longshore and John E. Riddle.

SALEM, IND.—The Kansas Telephone Company has been incorporated to build and equip a telephone exchange in Howard Township. The directors are: Frank P. Martindale, O. M. Mitchell and A. O. Marshall, R. F. D. No. 7.

LONE TREE, IA.—The Palestine Mutual Telephone Company has been incorporated with a capital stock of $2,000 and the following officers: Charles Shellady, president; James N. Duff, secretary, and E. Miller, treasurer, all of Lone Tree.

ST. FRANCIS, KAN.—The St. Francis Telephone Company has been incorporated with a capital stock of $20,000.

BOSTON, MASS.—The Onaway Telephone Company has been chartered with a capital stock of $50,000. The officers are: A. B. Grover, of Winchester, Mass., president, and C. E. Lock, of Pawtucket, R. I., treasurer.

CADILLAC, MICH.—Articles of incorporation have been filed for the Western Michigan Power Company by C. E. Russell, of Cadillac, Mich.; S. W. Cramer, of Cadillac, Mich., and F. H. Mills, of Boston, Mass. The company proposes to develop water power on the Manistee River at the High Bridge dam site, where it is claimed that 18,000 hp can be developed.

RENSSELAER, N. Y.—The Rensselaer Home Telephone Company has filed articles of incorporation with the Secretary of State, with a capital stock of $50,000. The incorporators are: J. J. Hartigan, of Troy, N. Y.; M. A. Heeran, of Rensselaer, N. Y., and W. J. Roche, of Troy, N. Y.

FARGO, N. D.—Articles of incorporation have been filed for the Reed & Raymond Telephone Company with a capital stock of $11,500 by Hans Hoglund, N. B. Pinkham, of Fargo, and others.

BUFFALO, OKLA.—The Harper County Mutual Telephone Company has been chartered, with a capital stock of $3,000, by Oscar S. Hammerstein, W. H. Richardson and John Etherton, all of Harper, Okla.

SHEFFIELD, PA.—Articles of incorporation have been filed for the Sheffield Telephone Company, with a capital stock of $15,000.

LEXINGTON, S. C.—The Hollow Creek Telephone Company has been organized to construct rural telephone lines to connect with the main line. Haskell Shull is president. Address R. F. D. No. 3, Gilbert, S. C.

CHATTANOOGA, TENN.—The Chattanooga Lighting Company has been incorporated with a capital stock of $10,000 by A. O. Lane, T. B. Murray and others.

NASHVILLE, TENN.—The Nashville Ice, Coal & Light Company has been chartered with a capital stock of $25,000 and the following named officers: C. W. Dodson, president; O. O. Moore, vice-president, and W. J. Peppard, secretary and treasurer.

TRIMBLE, TENN.—The Trimble Telephone Company has been incorporated by B. V. Thomas, J. M. McKennon, T. A. Pierce and others.

BRUNNER (P. O. HOUSTON), TEX.—Articles of incorporation have been filed for the Brunner Water & Light Company, with a capital stock of $50,000, by George L. Linck, J. W. Pruett, D. F. Rowe, of Houston, and L. N. Yarbrough, of Brunner, Tex.

MARATHON, TEX.—Articles of incorporation have been filed for the Marathon Telephone Company, with the following named officers: J. G. Reininger, president; G. C. Miller, vice-president; W. J. Newsome, secretary, and L. L. Hess, treasurer.

PROVO, UTAH.—Articles of incorporation have been filed for the Snake Creek Power Company with a capital stock of $100,000. The company is to take over the water rights in Snake Creek, in Wasatch County, owned by James Murdock and the Wasatch Development Company. The officers of the company are: Jesse Knight, president; Joseph R. Murdock, vice-president; R. E. Allen, secretary, and James C. Jensen, treasurer.

FARMINGTON, UTAH.—Articles of incorporation have been filed with the Secretary of State for the Davis County Independent Telephone Company, with a capital stock of $40,000. Sumner Gleason is president and N. B. Stahle secretary and manager.

TOOELE, UTAH.—The Tooele Valley Railway Company has been chartered to construct an electric railway from Black Rock into Pine Canyon through Tooele, to a connection with the San Pedro, Los Angeles & Salt Lake Railway west of Tooele, a distance of 25 miles. The general offices will be located in Salt Lake City, Utah. C. F. Kelly, of Butte, Mont., and J. B. Risque, of Salt Lake City, are interested in the enterprise.

FRONT ROYAL, VA.—The Liberty Corner Mutual Telephone Company has been incorporated with a capital stock of $5,000. The officers are: R. J. Stokes, president; John Derflinger, vice-president, and C. E. Brown, secretary and treasurer.

LEXINGTON, VA.—The Rockbridge Power Corporation has been chartered, with a capital stock of $25,000, to operate a light, heat and power plant. The president of the company is W. G. Matthews, Clifton Forge, Va. W. T. Paxton, of Beuna Vista, Va., is secretary and treasurer.

SOUTH RYEGATE, VT.—Articles of incorporation have been filed for the Blue Mountain Telephone Company, with a capital stock of $30,000, by M. F. Sargent, Albert Wright, Alex. T. Beaton, Carl Brown, George B. Robin, G. B. Steele, A. J. Witcher, C. M. Libby and Robert Earquharson. The company proposes to erect telephone lines in Groton, Ryegate, Newbury and Topsham.

WEST TOWNSEND, VT.—The West Townsend Telephone Company has filed articles of incorporation for the purpose of erecting a telephone line between West Townsend and Windham. The incorporators are G. T. Gale, L. F. Lensson and others.

ABERDEEN, WASH.—The Greyport Electric Company has been incorporated, with a capital stock of $6,000, by H. A. Bottomley and others.

BAKER, WASH.—The Skagit River Telegraph & Telephone Company has been chartered, with a capital stock of $10,000, by J. C. Eden and R. J. Kellogg.

GOLDENDALE, WASH.—The Farmers' Union Telephone Company has been formed by residents of Klickitat County. The company proposes to unite all farmers' lines and operate them upon an actual cost basis.

FAIRMONT, W. VA.—The National Telephone Company has been incorporated, with a capital stock of $50,000, by C. E. Manley, J. W. Barnes and E. F. Hardy.

BERLIN, WIS.—The Berlin Telephone Company has been incorporated, with a capital stock of $6,000, by C. S. Morris, L. C. Peck and Charles L. Bryden.

ST. JOSEPH, WIS.—The Houlton Rural Telephone Company has been chartered, with a capital stock of $3,600, by C. M. Steindorff, J. E. Frawley and E. B. Nehder.

STURGEON BAY, WIS.—The Sawyer & Western Telephone Company has been incorporated, with a capital stock of $600, to construct and maintain a telephone line in the town of Nasewaupee. Chris Hanson is president and Melvin Haines vice-president.

WAUTOMA, WIS.—The White River Farmers' Telephone Company has been incorporated, with a capital stock of $1,500, by Julius Groskreutz and others.

GROVER, WYO.—The Grover Telephone Company has been organized, with a capital stock of $10,000. The company proposes to construct a telephone line from Greeley to Cheyenne. The incorporators are E. E. Lewis, A. B. Hilton, G. E. Morris, all of Grover, Wyo.

HANNON, ONT., CAN.—The Barton & Binbrook Telephone Company has been incorporated with a capital of $10,000 by T. E. Tidey, of Barton; H. Johnson and N. Laidman, of Binbrook.

Personal.

MR. JAMES K. WILSON has been appointed superintendent of the Middle Creek Electric Company, Sunbury, Pa.

MR. ALEXANDER C. MIDDLETON, an electrical engineer of Bridgeport, Conn., and for a number of years connected with the steam-turbine department of the General Electric Company, was married last week to Miss Margaret C. Haman, of New York.

MR. J. ROBERT McFARLIN has been transferred from the Engineering Department of the Electric Service Supplies Company, of Keokuk, Iowa, to the Sales Department of the same company at Philadelphia, where he will engage in work as special engineering representative.

MR. E. W. GOLDSCHMIDT, New York manager of the Wagner Electric Manufacturing Company, sailed from Antwerp Jan. 16 on his return to this country after a four months' vacation. Mr. Goldschmidt has been

touring the Continent by automobile, after spending a couple of months rusticating in Southern Italy, which he fortunately left before the recent earthquake.

MR. JOSEPH CACCAVAJO, formerly consulting engineer for the Fulton Street Merchants' Association, of Brooklyn, N. Y., has, it is stated, been retained by a syndicate of capitalists to make a study of city traffic conditions in Japan with a view to laying out plans for the construction and operation of comprehensive systems of electric railways in Japanese cities.

MR. GEORGE A. NELLIS, who was with the Westinghouse lamp interests for 12 years, mostly as senior salesman and lamp expert, has become associated with the Liberty Electric Manufacturing Company, 543 Fourth Avenue, Pittsburgh, in the manufacture and sale of Liberty lamps. This new product is being put on the market in the form of tungsten, tantalum and metallized filament lamps.

MR. GEORGE HEARN is now president and treasurer of the Ricker Manufacturing Company, but for the present remains manager also, giving most of his attention to the electrical end of the business. He was formerly with the Rochester Railway & Light Company, being in its employ for over 15 years, becoming assistant superintendent after experience in every branch. The knowledge thus obtained is useful to him in the new surroundings, and in the production of articles to meet the varied needs of the industry.

MR. F. R. BRYANT is now in charge of the Chicago office of the Crescent Company, of Valparaiso, Ind. He was for five years connected with the sales department of the Central Electric Company, Chicago. At first he handled only the advertising part of the business, but later, while still retaining supervision of that, devoted a great deal of time to sales work. In his new sphere of activity he is outlining vigorous campaigns for business along the lines with which the company is already associated, and also with the idea of broadening the scope of its enterprise.

MR. L. A. FERGUSON, president of the American Institute of Electrical Engineers, was the guest of the University of Illinois, A. I. E. E. Section, on Friday afternoon, Jan. 15, at which he gave an interesting talk on "Training the Electrical Engineer." One of the points brought up by Mr. Ferguson was that among electrical engineers there is a tendency to shun the commercial side of the profession, and he pointed out the mistake in this idea. He also pointed out the great desirability of a broad general education, and emphasized the importance of a knowledge of foreign languages, law and business. The audience consisted of 250 students and members of the faculty.

MR. ALBERT H. STANLEY, general manager of the Underground System of London, is in New York. Mr. Stanley, who was formerly general manager of The Public Service Corporation of New Jersey and also of the United Railways System of Detroit, will inspect New York's rapid transit facilities. Speaking of the London service, Mr. Stanley said: "The London tubes are located much deeper than the Subway. The tubes, of which there are altogether about 100 miles in London, vary from a depth of 80 to 180 ft., while the District and Metropolitan Railways, of which there are altogether 80 miles, are shallow and built similar to the Subway. All passengers are required to use elevators to reach the railway, which makes it necessary to build the stations on private property."

MR. GEORGE WILLIAMS, of H. L. Doherty & Company, gave a stereopticon talk before the Lincoln Ad Club, Lincoln, Neb., on Jan. 14, on "Display Lighting in American Cities." It was accompanied by a talk on "General Advertising," by Senator G. W. Wiltse.

MR. T. N. VAIL, president of the American Telephone & Telegraph Company, has recently returned from his trip to London and Paris and says: "There is a very considerable interest in American Telephone securities abroad, particularly in London, which has shared by syndicate participation in the last two lots of convertible bonds issued by the company. The French interest is on the increase and several millions of our securities are now in hands of French investors. It goes without saying that the Frenchman puts his money only into investments which he has first carefully investigated, so that the French indorsement of American Telephone is a distinct compliment to the intrinsic worth of our securities. The English telephone system is steadily improving and is undoubtedly more efficient and in better physical condition than any of the continental systems. The stock of the International Telephone Company, which controls the telephone system of the country, is now selling above par. The property of the company is shortly to be taken over by the government and will be operated by the post office department. It is, I think, an interesting commentary upon the confidence the English investor has in the integrity and fair-mindedness of his government that the stock of this company should be selling above par, although the basis of the appraisement of the property is not yet known."

MR. G. REKERS severs his connection with the General Signal Company, of Rochester, N. Y., on Feb. 1 and has accepted the position of factory manager and engineer with the Rochester Coil Company. He was the superintendent of the electrical department of the Signal Company for the past eight years, prior to which time he was with the Siemens-Halske Company, of Chicago, for three years as assistant foreman in the winding department. The principal business of the Rochester Coil Company is now in a new patented armature coil adaptable to any size or type of armature. Mr. Rekers is familiar with the requirements of armature and field coils, and will turn out also form-wound magnet coils. For several years prior to his connection with the Siemens-Halske interests he had experience in the railway business and repair shops.

MR. B. C. ADAMS has been chosen president of the Lincoln (Neb.) Gas & Electric Light Company. He had been general superintendent for two years, when he had charge of the rebuilding of the gas and electric light plants and the general supervision of the company's work. Mr. Adams is a graduate of the University of Wisconsin, class of 1899. Shortly after he completed his course he entered the employ of the Madison (Wis.) Gas & Electric Light Company. He received rapid promotion until he became the head of the accounting, distribution and service departments. While in the employ of the Madison company he was consulting engineer of a number of public utility organizations in Wisconsin. Besides being prominently connected with the Northwestern Electrical Association, he has served on a number of committees of the National Electric Light Association, the American Institute of Electrical Engineers and the American Gas Institute. Mr. Adams is the son of the late Congressman H. C. Adams, of Wisconsin. He was married a little more than a year ago to Miss Rachel Nicholson, the eldest daughter of Professor Nicholson, who was at the head of the chemical department of the Nebraska University.

MR. L. H. CONKLIN, of Connellsville, Pa., who was recently elected the first president of the new Pennsylvania Electric Association, graduated from Pratt Institute, Brooklyn, in 1891, having completed the full technical course of that institute. From 1891 to 1894, working in various factories, etc., he acquired experience in the practical side of the business. From 1894 to 1896 he was expert on the arc apparatus for the Excelsior Electric Company, manufacturing the arc machines designed by the late Wm. Hockhousen, to whom he afterward became chief assistant, being closely associated with him in his own private work and having the title of Assistant Superintendent of the factory. From 1896 to 1900 he was superintendent of the electric plant operated by the Flatbush Gas Company, of Brooklyn, N. Y. This plant took in the extensive suburban districts of New York known as Flatbush, Flatlands and Coney Island. During his connection with this plant he remodeled the entire system and put the company on a paying basis for the first time. He then engaged in an engineering and contracting business in New York City under the firm name of Weiderman & Conklin. This business was very successful and is still being carried on, but for family reasons, however, he was obliged to go South in the spring of 1904 and there operated a hosiery mill of which he was principal owner. In the spring of 1905 Mr. Conklin returned North and entered the employ of Mr. A. M. Young, the so-called "trolley king" of Connecticut and a director of the American Gas & Electric Company and several other electrical enterprises. During his employment by Mr. Young he worked as his engineer in the New England territory, rebuilding and modernizing several electric light plants and then building a trolley road. In the spring of 1907 Mr. Conklin went with the West Penn Electric Company, of Pittsburgh, as superintendent of lighting and in August of the same year he was made general superintendent of the West Penn Railways Company; the West Penn Electric Company; Pittsburgh, McKeesport & Greensburg Railway Company; Westmoreland Light, Heat & Power Company and the Latrobe Street Railway Company, constituting what is known as the West Penn system, operating the railways and lighting most of the towns in the four counties of Fayette, Westmoreland, Allegheny and Washington, which position he is now resigning to become general manager of the Scranton Electric Company. Mr. Conklin is a member of the American Institute of Electrical Engineers and, as already noted, the president of the Pennsylvania Electric Association, of which he was the organizer. This association is now composed of over fifty operating companies in Pennsylvania, including the four largest, and it is also the first State association to become a State branch of the National Electric Light Association.

MR. L. H. CONKLIN.

Trade Publications.

CONCRETE MIXERS driven by electric motors are discussed in a booklet issued by the Chain Belt Company, Milwaukee, Wis.

ROSETTES AND TAPLETS for wiring circuits are illustrated and described in Bulletin No. 62 of the H. T. Paiste Company, Philadelphia, Pa.

"THERMIT REPAIRS" is the title of a well-illustrated booklet recently issued by the Goldschmidt Thermit Company, 90 West Street, New York.

THE JAMES CLARK, JR., ELECTRIC COMPANY, Louisville, Ky., has issued a catalogue on the Willey electric driven tools, for which it is sales agent.

AIR HEATERS, using either steam or hot water, are discussed in a booklet designated as bulletin No. 118 of the Green Fuel Economizer Company, Matteawan, N. Y.

ELECTRIC CLOCKS of the self-winding type are well illustrated in a

neatly executed catalog, designated as Bulletin No. 11, of the Standard Electric Time Company, Waterbury, Conn.

EXPANSION JOINTS, for use with superheated and high-pressure steam, are well discussed in Catalog No. 11 of the Alberger Condenser Company, 95 Liberty Street, New York City.

LAMP SOCKETS.—The James Clark, Jr., Electric Company, 313 West Main Street, Louisville, Ky., has issued a folder devoted to swiveling cap fixture sockets and push snap sockets.

STEAM TRAPS of the tilting tank type and return traps are illustrated, described and listed in a neat publication, designated as No. 247 of the American Blower Company, Detroit, Mich.

BALL BEARINGS.—The International Engineering Co., 1779 Broadway, New York City, has issued a catalog dealing with ball bearings for automobiles, motor boats, electrical machinery, etc.

GATE VALVE.—Walch & Wyeth, 87 Lake Street, Chicago, have issued a bulletin devoted exclusively to the Erwood swing-gate valve, which serves simultaneously as a gate valve and as check valve.

NERNST LAMPS.—Vol. VI, No. 6, of the *Glower*, published by the Nernst Lamp Company, Pittsburgh, Pa., contains an excellent outline of the numerous Nernst lamp installations in Cleveland, Ohio.

TUNGSTEN LAMPS for series street circuits are discussed in a convincing manner in a publication dealing with costs, designated as Bulletin No. 3728, issued by the General Electric Company, Harrison, N. J.

ELECTRIC TRUCKS.—Full details of electrically propelled trucks for loads varying from 1000 lbs. to 5 tons are given in an illustrated bulletin issued by the Commercial Truck Company of America, Philadelphia, Pa.

MACHINE TOOLS of the automatic and semi-automatic screw-cutting types are well described and effectively illustrated in a neatly executed catalogue of the National Acme Manufacturing Company, Cleveland, Ohio.

MOTOR-DRIVEN TOOLS, including drills, grinders, saws, notching presses and winding machines, are illustrated, listed and described in a catalog issued by the James Clark, Jr., Electric Company, 313 West Main Street, Louisville, Ky.

REFLECTORS producing an opalescent effect with the minimum of light absorption are listed and described with photometric curves in a bulletin issued by the Pettingell-Andrews Company, Pearl Street and Atlantic Avenue, Boston, Mass.

FANS.—Catalog No. 5020 of the Emerson Electric Manufacturing Company, St. Louis, Mo., gives much information concerning its 1909 line of alternating current fans. The motors for all of these fans are of the single-phase self-starting induction type.

STEAM CONDENSING APPARATUS.—An elaborately colored folder issued by the Dean Brothers' Steam Pump Works, Indianapolis, Ind., relates to a vertical air pump and jet condenser, which is claimed to produce the highest vacuum practically attainable.

CENTRAL-STATION EQUIPMENTS.—Bulletin No. 5910-G of the Western Electric Company, Chicago, Ill., is devoted to brief technical descriptions of apparatus for central stations, including alternating-current and direct-current generators, arc lamps and switchboards.

SECOND-HAND STEAM AND ELECTRICAL MACHINES, including engines, boilers, compressors, generators, motors, converters, arc lamps and switchboards, are covered in the January price list of MacGovern, Archer & Company, 114 Liberty Street, New York City.

ELECTRIC WAGONS in which use is made of the new Edison batteries are outlined and listed in a folder issued by the Lansden Company, Newark, N. J. These vehicles are competitors of horse-drawn wagons and trucks; they are built for loads ranging from 350 lb. to 3 tons.

THERMAL INSULATION.—The H. W. Johns-Manville Company, 100 William Street, New York City, has issued a clearly illustrated catalog describing thermal insulating materials for covering pipes and boilers. The coverings are made from asbestos fiber and carbonate of magnesia.

POLYPHASE INDUCTION MOTORS.—Bulletin No. 82 of the Wagner Electric Manufacturing Company, St. Louis, Mo., gives a well-arranged outline of the constructive features and operating characteristics of polyphase induction motors of the wound-rotor and squirrel-cage types.

SEAL OF APPROVAL.—The General Incandescent Lamp Company, of Cleveland, Ohio, has utilized a shaped cardboard folder, showing an old-fashioned wax seal, to illustrate the idea of the public setting its seal of approval on its G.-I. tungsten lamps, details in regard to which are given.

KNIFE SWITCHES.—Bulletin No. 19 of the H. Krantz Manufacturing Company, 160 Seventh Street, Brooklyn, N. Y., contains price lists and illustrations of knife switches, fuse blocks and wire connectors for currents up to 1000 amp. Panel board units are shown in leaflets of the same company.

THE METROPOLITAN ELECTRICAL SUPPLY COMPANY, Chicago, Ill., is sending out circulars describing the electric flatirons which the company has recently placed on the market. This iron is claimed to have several interesting features not included in the manufacture of other electric irons.

MOTORS.—The Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa., has issued an interesting booklet devoted to a discussion of display window advertising. The keynote of the publication is education of the public concerning the application of electric motors especially to domestic uses.

TELEPHONES.—The Stromberg-Carlson Telephone Manufacturing Company, Rochester, N. Y., has issued pamphlet No. 10, dealing with two-piece desk telephones and both series and bridging dry-battery wall telephones. The pamphlet contains a complete tabulation of prices for magneto instruments.

ELECTRIC TRUCKS.—Bulletin No. 4 of the Pittsburg Motor Vehicle Company, Pittsburg, Pa., gives many convincing statements of the advantageous features of electric trucks in competition with horse-drawn trucks. Illustrations are given of a 3000-lb. truck that does the work of two horse-drawn trucks.

VARIABLE SPEED STEAM ENGINES, designed for driving paper-making machinery, are briefly described in bulletin No. 244 of the American Blower Company, Detroit, Mich. These engines are equipped with a variable speed ratio mechanism for connecting the engine shaft to the governor. A speed variation of 5 to 1 is thereby obtained.

DISTRIBUTION OF ELECTRICAL ENERGY.—A neatly illustrated bulletin, entitled "Distribution of Electrical Energy," has been issued by Mr. G. M. Gest, 227 Broadway, New York, for showing the advantages of underground conduit construction. Typical examples of conduit systems in the process of installation are illustrated in a striking manner.

ELECTRIC PYROMETERS.—The Bristol Company, Waterbury, Conn., has issued Bulletin No. 100, giving an outline description of recording electric pyrometers, which are elaborately illustrated. These pyrometers are especially valuable for use with annealing furnaces, case-hardening furnaces, water-gas machines, blast furnaces, galvanizing plants, gas producers and open-hearth furnaces.

MOTOR-GENERATORS of the direct, alternating and combined types, rated at from 0.075 kw to 12.0 kw, are illustrated, listed and described in Bulletin No. 47 of the Eck Dynamo & Motor Company, Belleville, N. J. Direct-current generators rated at from 0.035 kw to 15.0 kw are treated in Bulletin No. 39, while Bulletin No. 40 deals with direct-current motors rated at from 0.033 hp to 20 hp.

BLAKE SIGNAL & MANUFACTURING COMPANY, 246 Summer Street, Boston, Mass., has sent out an envelope-size four-page folder illustrative and descriptive of its Blake tube flux. This is shown in the process of being applied on armature coil ends. The spout of the tube is aluminum, allowing the paste to be applied directly at the joint at the same time as the heat, without soldering up the vent.

THE LAGONDA MANUFACTURING COMPANY is distributing a booklet of 24 pages on "The Scale Question." It gives numerous facts about steam power plant economy and protection. Among the new Lagonda products described therein is the Weinland air-driven wing-head cleaner. This machine is a miniature rotary engine which goes into the tube and rotates the cleaning head in much the same manner as a turbine does, but is more powerful. The pamphlet will be sent to all who write to the Lagonda Manufacturing Company, Springfield, Ohio.

VACUUM DRYING AND IMPREGNATING DEVICES are described and illustrated in a folder issued by the J. P. Devine Company, 428 Brisbane Building, Maryland and Seventh Streets, Buffalo, N. Y. These devices are built under Emil Passburg patents. They are employed in the preparation of chemicals, the manufacture of electrical apparatus, the vulcanizing of rubber and in numerous other industries. It is claimed that more than 2000 installations are now in successful operation. A list of the users of Passburg apparatus is published by the company in booklet form.

VALUE OF THE TUNGSTEN.—Pamphlet No. 3728, just issued by the General Electric Company, gives, by means of tables and curves, a brief exhibit of the value and economy of tungsten series street lamps, showing the saving and possible gain in income. It shows the rate at which the tungsten lamp is able to compete with Welsbach gas street lamps, the economical life of the tungsten lamp, the relative cost of producing a candle-hour of light with the tungsten as compared with the carbon and Gem, and the candle-power and life performance of the tungsten series lamp.

MERCURY ARC RECTIFIERS.—In Pamphlet No. 3715, just issued by the General Electric Company, are described mercury arc rectifiers for telephone battery charging. The advantage which this outfit is claimed to have over the general motor-generator sets, rotary converters and electrolytic rectifiers for charging central telephone batteries, is reliability, freedom from line disturbances, high efficiency, low first cost, low cost of maintenance, simplicity of operation, noiseless operation and economy of floor space. The pamphlet contains a detailed description of the outfit with connection diagrams and dimensions.

TUNGSTEN LAMPS FOR BATTERY SERVICE.—Bulletin No. 4637, issued recently by the General Electric Company, illustrates and describes various styles and sizes of tungsten lamps for battery service. The high efficiency of the tungsten filament renders it especially suited to the production of an ideal battery lamp where high efficiency is necessarily a prime requisite. The bulletin illustrates and describes battery, novelty and surgical lamps, lamps for limousine automobile lighting and various other styles with miniature bases and bases adapted for use in standard sockets. The bulletin contains also prices of the various types.

TRANSFORMER FOR MOVING PICTURE MACHINES.—In a folder just issued by the General Electric Company is described its transformer for use in connection with moving picture machine arc lamps. It is known as the G. E. Economy Arc, and the advantages claimed for it are reduction of light bills, simplicity of operation and

safety. The saving in energy insured by the use of a transformer instead of a rheostat varies, it is said, from 65 to 90 per cent, depending upon the voltage of the circuit. The construction of this transformer is very substantial and embodies all of the distinctive features of the transformers manufactured by this company.

DAYTON GLOBE IRON WORKS.—There has just been issued from the press of the Caxton Company, Cleveland, Ohio, a 7000-edition, 80-page catalog for the Dayton Globe Iron Works Company, of Dayton, Ohio, describing and illustrating the New American turbine. It is printed on high-grade coated paper. The cover is of dark gray stock with a light gray flyleaf and is highly embossed with the company's name and the name of the product. A pleasing effect is obtained by the use of a tint block in a delicate shade which overcomes the high gloss of the paper stock and makes the illustrations more attractive by having the high lights cut away and bringing them out in white. Not only the tables of power of the various types of New American turbines, but other tables of value to those interested in water-power development are contained in this book.

Business Notes.

SCHUCHARDT & SCHUTTE have removed their New York offices and warerooms from 136 Liberty Street to the West Street Building, 90 West Street, where they are now installed.

THE METROPOLITAN ELECTRICAL SUPPLY COMPANY, of Chicago, asks us to state that it has no connection with a company in New York of the same name, thereby correcting a misunderstanding recently brought to its attention on this point.

THE WAGNER ELECTRIC MANUFACTURING COMPANY has opened a sales office in the Trust Building, Charlotte, N. C., to assist in the care of its rapidly growing Southern business. The Wagner Company's other office in the South is in Atlanta, Ga., and the factory and the main office, as is well known, are in St. Louis.

SOLDERLESS CONNECTORS.—Dossert & Company, of New York, have received an order from the National Electrical Supply Company, of Washington, D. C., for a large number of solderless connectors, cable taps and terminal lugs specified by the Isthmian Canal Commission; also an order from the San Francisco Gas & Electric Company for 300 cable taps and from the Fairbanks-Morse Electrical Manufacturing Company, of Indianapolis, Ind., for 100 Dossert insulating joints.

STANDARD ROLLER BEARING.—Supplementing its established testing department, the Standard Roller Bearing Company, of Philadelphia, has secured Henry Souther, the well-known engineer of Hartford, Conn., to devote a large part of his time to its interests as consulting engineer. Mr. Souther's services have recently been employed to some extent by this company in this direction, and the above arrangement is the outcome of the satisfactory results obtained in the betterment of its product.

THE BLAKE SIGNAL & MANUFACTURING COMPANY, Boston, Mass., is receiving flattering commendations of its wares, of which the following extracts from recent letters are examples: "In regard to the sample of Blake tube flux received from you, will say that I have never used anything for soldering that equals it." From a telephone company: "We find the Blake insulated staples, compressed cleats and tube flux the best for their respective purposes that we have ever used and are buying them regularly from our dealers."

THE STAVE ELECTRICAL COMPANY, 27 West Twenty-seventh Street, New York City, has now established branches in Chicago, Detroit, Davenport, Pittsburgh, Philadelphia and Cleveland. The rapid extension of the business has made this necessary, and it answers the convenience of the districts thus covered. Each of the branches carries a large stock of the well-known "Stave" flaming arc lamps and the "Stavelco" lamp. Mr. J. J. Batterman, general sales manager of the company, has just returned from an extended trip through the Central and Western States and to the various branch offices. He reports a very brisk business in the lamps, especially in Illinois and Pennsylvania.

THE SUNBEAM INCANDESCENT LAMP COMPANY, Chicago, has moved its sales office and warehouse from 32 West Polk Street to the Western Electric Company Building, at 259 South Clinton Street, Chicago. This change was made as larger quarters were needed to properly take care of the increased volume of business being handled by both the Sunbeam Company and the Western Electric Company since the adoption of the Sunbeam tungsten lamp. The Sunbeam product is well and favorably known, having been on the market continuously for 20 years. The company manufactures a complete line consisting of, in addition to regular lamps, Gem, tantalum and tungsten filament lamps of all styles, candlepowers and voltage. The entire output of the Sunbeam Incandescent Lamp Company is distributed through the Western Electric Company.

THE DEARBORN DRUG & CHEMICAL WORKS, Chicago, report that the general business of the company for the last six months of 1908 was larger than for any other six months in its history, indicating the quick return of prosperous business conditions. The percentage of increase the past few months, and especially for January, in the Eastern department of the company is particularly gratifying. Mr. Grant W. Spear, vice-president and Eastern manager, at the general Eastern offices, 299 Broadway, New York, who has been for years vice-president of the Dearborn company at Chicago, assisted by Mr. Herbert E. Stone as general sales manager, Mr. P. H. Hogan, manager of the Boston office, and Mr. Paul T. Payne, manager of the Philadelphia office, with Mr. P. G. Jones as special representative in the Philadelphia district, together with such popular and able representatives out of the New York office as Messrs. McConnaughy, Mitchell, etc., constitute a most effective organization.

Weekly Record of Electrical Patents

UNITED STATES PATENTS ISSUED JAN. 19, 1909.

[Conducted by William F. Bissing, Patent Law, 2 Rector St., N. Y. City.]

909,872. ELECTRIC ELEVATOR; William M. Cummiskey, Honesdale, Pa. App. filed June 5, 1908. Increases the safety of electric elevators, by insuring the proper order of steps in the operation of the controller and by preventing overload. The motor is provided with a retarding element and electro-magnetic means for removing the element. A resistance is included in circuit with said means and a brake for the motor is arranged to cut the resistance out of circuit.

909,877. TELEGRAPHY; T. A. Edison, Llewellyn Park, Orange, N. J. App. filed June 20, 1907. Improvement in quadruplex relays in which the neutral relay is so designed as to be unaffected by reversals of current. A series of rectifiers is disposed between the relay and the circuit so as to cause all of the currents to pass through the relay in the same direction.

909,889. ELECTRIC ELEVATOR; H. F. Gurney, Jersey City, N. J., and William Cummiskey, Honesdale, Pa. App. filed Feb. 26, 1908. (See Patent 909,872.)

909,896. ELECTRIC VAPORIZER FOR INTERNAL-COMBUSTION ENGINES; H. Hertzberg, New York, and A. A. Low, Horseshoe, N. Y. App. filed Feb. 11, 1907. An electrical heater for heating the plate against which the petroleum is sprayed. Two thin plates of metal contain between them an electrical resistance which is made of a fine metallic wire or ribbon coiled on a core.

909,897. EXTERNAL ELECTRICAL VAPORIZER FOR COMBUSTION-ENGINES; H. Hertzberg, New York. App. filed March 12, 1907. An electrical heater like that of Patent 909,896 is arranged at the end of a vaporizing chamber into which the petroleum is sprayed. The entire metallic mass of the walls of the chamber and of the heater is made hot.

909,898. INTERNAL ELECTRIC STARTING-VAPORIZER FOR COMBUSTION-ENGINES; H. Hertzberg, New York; A. A. Low, Horseshoe, and A. Wassmann, Astoria, N. Y. App. filed April 16, 1907. A hollow vaporizer is located internally of the engine cylinder, and an electrically heated starting vaporizer is arranged within the hollow vaporizer.

909,899. ELECTRICAL VAPORIZER FOR INTERNAL-COMBUSTION ENGINES; Harry Hertzberg, New York, and A. A. Low, Horseshoe, N. Y. App. filed Feb. 11, 1907. An electrically heated vaporizer is located internally of the combustion chamber or piston cylinder of the engine, and is provided with means for circulating a cooling medium in the vaporizer.

909,900. ELECTRICALLY HEATED STARTING-VAPORIZER FOR INTERNAL-COMBUSTION ENGINES; Harry Hertzberg, New York, and A. A. Low, Horseshoe, N. Y. App. filed Feb. 11, 1907. The heater consists of a plurality of units, each having a mass of heat-absorbing metal, and an electrically-operated heater within the mass of metal. The liquid combustible strikes the hot metallic surfaces.

909,917. ELECTRICALLY OPERATED STARTING-VAPORIZER FOR COMBUSTION ENGINES; A. A. Low, Horseshoe, N. Y. App. filed June 8, 1907. The vaporizer consists of a metal having its two surfaces at an angle to each other with one of the surfaces corrugated to increase its surface area and an electrical means for heating the element.

909,935. PROTECTED INSULATOR; John H. B. Rea, La Fayette, Ga. App. filed May 7, 1908. A glass insulator with a non-breakable protective covering of metal which surrounds the external surface of the insulator, and which is cemented thereto.

909,943. WIRE-CONNECTOR; J. M. Sahlin, Chicago, Ill. App. filed Feb. 11, 1907. Duplicate members formed of tapering sleeves with semi-circular openings and tongues are adapted to interlock with each other.

909,987. PROCESS OF TREATING SUGAR-CANE AND SIMILAR SUBSTANCES; G. D. Burton, Boston, Mass. App. filed Oct. 17, 1906. Bleaches and softens the fibers of sugar-cane and the like so that they may be used in the arts by immersing the fibers, after removing the juices, in a bath containing animal grease and a quantity of electrolytic chemical salts. The bath is then heated and an electric current passed there through.

909,993. TROLLEY-WIRE SUPPORT; C. G. Etee, St. Louis, Mo. App. filed May 4, 1908. The device has a cast metal shank with lugs at its upper end which grip the supporting wire. The trolley wire is connected to a jaw at the lower end of the shank.

910,040. TRAIN LINE COUPLING; W. L. Bliss, Brooklyn, N. Y. App. filed Nov. 28, 1904. The coupling members of the air-pipe line are used to connect the sections of the electric line.

910,042. MOTOR-CONTROLLING DEVICE; C. E. Carpenter, New York, N. Y. App. filed May 9, 1907. Permits the motor to start with all the armature resistance in circuit which is cut out at speed. A field resistance is used for controlling the speed of the motor.

910,058. ELECTRICAL CONTROLLING MECHANISM; W. O. Haymond and J. O. Potter, Muncie, Ind. App. filed July 20, 1907. Particularly for actuating dampers to supply hot air to a room. Two electro-magnets are used to attract a solenoid core in opposite directions. The magnets are controlled by a thermostat.

910,092. CONTROLLER FOR RADIATOR-VALVES; F. A. Simonds, Grand Rapids, Mich. App. filed March 24, 1906. Controls the radiator valve of a steam radiator by an electro-magnetic controlling device operated by a thermostat. Details.

910,118. FIRE-ALARM SIGNALING DEVICE; F. C. Crutchfield, Washington, D. C. App. filed May 3, 1907. A switch controlled by a fusible plug which normally holds a circuit closing spring in inoperative position which, when the plug fuses, closes the circuit and gives an alarm. When the alarm has been sounded the circuit is reopened.

910,161. TROLLEY; W. J. Baker, Washington, D. C. App. filed Jan. 29, 1907. Prevents the trolley wheel from leaving the wire, by means of weighted fingers attached to the wheel support and projecting over the wire.

910,165. TURBO-GENERATOR; E. J. Berg, Schenectady, N. Y. App. filed Sept. 7, 1907. A bucket-wheel turbine divided into two stages, each containing independently rotating wheels. A shaft is driven at high speed by one of the wheels and carries an induction alternator. A second shaft is driven at a lower speed by the other wheel and carries a synchronous alternator.

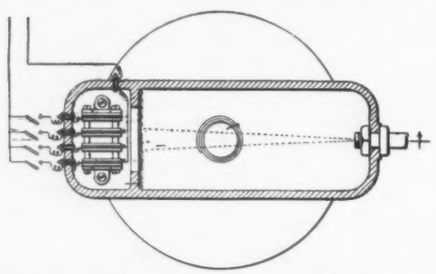
910,176. ANTI-INDUCTION METHOD FOR TELEPHONE SYSTEMS; William Condon and Albert Barrett, Kansas City, Mo. App. filed May 27, 1907. Avoids disturbances due to induction in systems in which the transmitters and a battery are located in a primary line circuit and the receivers in a secondary circuit inductively connected therewith. The disturbing currents are caused to induce in the secondary circuit currents contrary in direction, but equal in strength to the talking currents so as to nullify each other.

910,177. ANTI-INDUCTION TELEPHONE SYSTEM; William Condon and Albert Barrett, Kansas City, Mo. Anti-inductive device along the lines of 910,176, in which an ordinary condenser is connected in series with half of the primary circuit. The direct telephone current and the alternating disturbing current divide at the center of the primary winding, the disturbing current passing through the condenser. Two opposite and balancing fields of induction are formed.

910,184. RAILWAY SIGNAL SYSTEM; C. E. Duffie, Omaha, Neb. App. filed Aug. 19, 1907. The signal circuits are not grounded, thus permitting the use of high-voltage currents, and they are not electrically connected with the track circuit. A plurality of normally closed overlapping independent signal circuits are used together with a normally closed track circuit, with means in the track circuit for opening and closing all of the signal circuits.

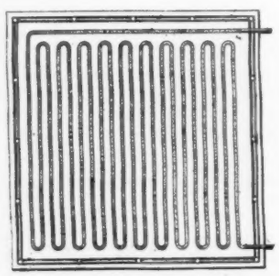
910,185. ELECTRIC LAMP SOCKET; V. E. Extrom and C. H. Grundy, Tomahawk, Wis. App. filed Oct. 9, 1907. A lamp socket which, by means of a single key, will light two lamps or either one, and put them out. Details.

910,189. TELEPHONE ATTACHMENT; J. C. Fox, Seattle, Wash. App. filed June 18, 1907. Avoids holding the telephone by hand and makes use of a support consisting of two sections slidable one on the other, one secured to the standard and the other having a clip to receive the telephone receiver.



909,900—Electrically Heated Starting Vaporizer for Internal Combustion Engines.

910,191. ELECTRIC HEATER; G. V. K. Greene, New York, N. Y. App. filed Feb. 19, 1908. The heater consists of two plates of non-conducting material, one of the plates being formed with a continuous channel, the ends of which open to an edge of the plate. The channel is filled with a heating element of current resisting material.



910,191—Electric Heater.

910,197. OVERHEAD TROLLEY; J. H. Howard, Kansas City, Kan. App. filed Sept. 11, 1907. The trolley wheel presses against the trolley wire with the same force irrespective of the distance of the latter above the car. At the base of the pole on the car roof a drum is mounted containing a plurality of spring-actuated plungers coacting with a cam so as to exert a variable pressure upwardly on the trolley pole according to the inclination of the pole.

910,214. COMMUTATOR BRUSH; C. B. Mills, Wilmerding, Pa. App. filed Jan. 3, 1906. A carbon commutator brush with a slotted outer edge and a conducting strip within the slot having a portion projecting therefrom which engages a conductor in its fold.

910,222. LONCOMOTIVE ELECTRIC ALARM SYSTEM; G. Noreau, Quebec, Canada. App. filed Jan. 14, 1908. Part of the signalling apparatus is located in the locomotive, and is provided with a plunger carrying a contact wheel to close the circuits at the proper time. Details.

910,241. ROSETTE; J. S. Stewart, New York, N. Y. App. filed Dec. 23, 1907. Does away with forming a knot in the extension core by providing a partition or barrier in the rosette, together with a cover plate recessed to form two pairs of gripping surfaces in conjunction with the partition so as to engage the conductors.

910,243. MEANS FOR CONNECTING CONDUCTORS TO COMMUTATOR BRUSHES; N. W. Storer, Pittsburgh, Pa. App. filed April 4, 1906. The brush has a cavity and a recess and is provided with a plate which covers the cavity and that has a portion entering the recess. An expanded stud projects from the plate and is located in the cavity. The flexible conductor is connected to the plate.

910,244. TELEPHONE RECEIVER; Harve R. Stuart, Wheeling, W. Va. App. filed Jan. 10, 1907. The telephone receiver comprises separate magnet circuits with an armature for each of said circuits, the movement of the armature produced by the received voice current being multiplied to move the diaphragm, which in turn produces the sound.

910,261. FLOOR-BOX FOR ELECTRIC-CONDUCTOR TERMINALS; M. E. Ames and J. H. Goehst, Chicago, Ill. App. filed June 8, 1908. The box is provided with a rim and a detachable cover, together with an adjusting ring between the cover and the rim. The cover may be accurately fitted to the floor without accurately fitting the body to the floor.

910,269. TEMPERATURE-REGULATING APPARATUS; A. M. Butz, Oak Park, Ill. App. filed July 12, 1904. For steam heaters in which the control is effected by an electric motor, whose current is controlled by a thermostat.

910,314. THREE-WIRE TELEPHONE SYSTEM; William Reid, Chicago, Ill. App. filed Feb. 26, 1906. A common battery system provided with one or more supervisory relays with means associated with the third conductor for disconnecting the signaling apparatus from the line and closing the circuit of the supervisory relay, the latter relay controlling another signal circuit.

910,328. KNIFE SWITCH; G. B. Thomas, Bridgeport, Conn. App. filed May 26, 1908. The blade and the post are of flat metal, one having two leaves to embrace the end of the other. Details.

910,333. ELECTRIC SWITCH; E. B. Wedmore, Rugby, England. App. filed Nov. 20, 1905. Oil-brake switch provided with a detachable oil can for enclosing the switch contacts, together with a lever for shifting the can into and out of position.

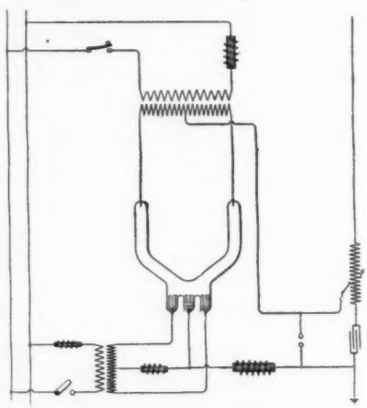
910,343. MOTOR-CONTROLLING RHEOSTAT; W. C. Yates, Schenectady, N. Y. App. filed July 3, 1907. A pair of resistances each provided with an independent controlling arm and means connected to one of said arms and inoperative until the arm stops at a predetermined position for moving the second arm to vary the resistance.

910,362. REMEDIAL HEAD-BAND; C. C. Dieudonne, Washington, D. C. App. filed Oct. 15, 1908. A copper plate which carries two zinc plates and is adapted to contact with the forehead.

910,381. BATH CABINET; John Hermann, Saginaw, Mich. App. filed March 25, 1907. The switches for controlling the bath may be operated from within the cabinet. The bath has a false bottom with openings, and electric lamps are arranged in the space between the false bottom and the base.

910,383. SANITARY SHIELD FOR TELEPHONES; O. H. Hudgen, Los Angeles, Cal. App. filed June 10, 1907. A rubber disk with an annular rib. The disk can be turned so a sto use either side as an outer face. It is placed over the mouthpiece of the telephone.

910,387. RAILWAY SIGNAL; W. H. Jordan, Brooklyn, N. Y., and G. T. Hanchett, Hackensack, N. J. App. filed June 14, 1905. Particularly adapted for trolley lines. Attempts to eliminate the residual magnetism of the cores of the solenoid magnets employed in the system by means of a separate demagnetizing coil.



910,430—Wireless Telegraph Transmitter.

910,412. ELECTRIC BELL; G. L. Patterson, New York, N. Y. App. filed Oct. 17, 1907. May be mounted in place before plastering. A hollow receptacle contains the parts with a plate adapted to close the open side of the receptacle. Details.

910,414. SPEED-LIMITING DEVICE FOR ELECTRICALLY-IGNITED EXPLOSIVE ENGINES; F. S. Perrin, New York, N. Y. Orig. app. filed Jan. 9, 1907. The speed is controlled by a governor which closes the contact at the desired speed. A scale and pointer permit setting the parts.

910,430. WIRELESS TELEGRAPH TRANSMITTER; C. P. Steinmetz, Schenectady, N. Y. App. filed April 20, 1907. Converts alternating current into direct current, which latter is used for discharging at the spark gap by means of a rectifier. The rectifier discharges are leveled by a reaction coil.

910,433. TROLLEY WHEEL; L. J. Tetlow, Holyoke, Mass. App. filed June 5, 1908. Relates to the bearings of a trolley wheel which consist of a series of disks enclosed within the shell of the wheel.

910,434. METHOD OF ELECTRIC WELDING; C. E. Thompson, Cleveland, O. App. filed June 11, 1907. For welding a brass head to a steel body by first reducing the cross-sectional area of the brass-head, which has the higher conductivity, then placing the reduced portion in contact with the face of the other part and passing a welding current between them.

910,454. RAILWAY SIGNALING; L. M. Bracewell, Sewal, Ia. App. filed April 29, 1907. Provides a service wire which runs along the track and a series of return wires with electric signaling lamps arranged between the wires. The lamps may be selectively operated by means of a switch at the station.

910,478. RHEOSTAT; W. C. Yates, Schenectady, N. Y. App. filed July 29, 1907. A plurality of automatically-operated rheostats with suitable connections whereby one of said rheostats starts another after a pre-determined movement.

910,479. ELECTRIC HEATER; W. S. Andrews, Schenectady, N. Y. App. filed Jan. 15, 1908. An electrical heater for heating a water receptacle or the like provided with a detachable cup which may be locked to the base of the heater so as to force it into the contact therewith.

910,481. ARC LAMP; R. Fleming, Lynn, Mass. App. filed Dec. 28, 1905. A flaming arc lamp provided with a suitable hood for the non-consuming positive electrode which serves as a conduit for carrying away the gaseous arc products. The positive electrode consists of a rod of metal with a number of supporting wings of metal extending away from the rod, said wings having large heat-radiating surfaces.